EchoStar / RCA
Satellite Receiver Schematics
28 / Jun / '03
Ver 4.0

Drawn by: MDevries

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Hi guys:

While these schematics are not perfect, they are quite compressive. They are the result of many nights work. Hopefully you find them useful and will support me in the drawing of more.

If you find any errors, and like any work in progress, I'm sure there are some, you can private message (PM) me at http.://id-discussions.com/vbulletin/index.php

Drawing up schematics of something as complicated as this, is not something you want to do with a working unit as you typically have to rip them apart, which unless you're very lucky, destroys them. Fortunately I had a dead 2700 I purchased on Ebay for $5.00. I would like to post more schematics and am looking for the following units (CHEAP/DEAD):

-Bell Express View 5100 / DishNet DP510: (would trade a larger Hard Drive for a complete unit),
-Bell Express View 3100 / DishNet DP310 version 1 & 2
-Echostar UHF receiver module from either a 6000 or a 4700
-4700,
-Any newer StarChoice unit.

One of the reasons I drew up these schematics was that I had noticed my 2700's PCB was laid out for several unpopulated components. I then developed the theory that the 27/3700 and the 4700 used the SAME PCB . i.e that the only difference between these models was in how the PCB was populated. I still hold this belief, unfortunately I now realize that such an upgrade is virtually impossible. The problem is the 4700 uses a custom IC, or ASIC, for the AC3 Dolby, the optical output, the IR Blaster and the UHF remote. To make things worse the 4700 also uses an obsolete IC for the system clock. As neither of these ICs are commercially available the upgrade can only be done by using a dead 4700 as a donor. :(

One important note: I've drawn up these schematics in the hope that they will be useful in the servicing of these receivers, and so that those of use who's' hobby is electronics can add features such as extra video and audio outputs. These schematics are NOT intended to aid in the hacking of satellite TV.

Cheers
M

EchoStar 2/3/4700:

A bit of warning. It appears that there are several PCB versions of the 27/37/4700. As such there may be slight variations between things such as component labels. Also the LNB Tuner and AC3 sections were drawn up without the aid of data sheets and as such I've have no means to cross check these pages, so please be very careful when using these two pages.

EchoStar 3100 / DP301 (with SC2000 & STi5518 processors)

These are works in progress. I have rough drafts of the audio, video and modem sections, which I'll work on and post as I have time.

EchoStar 6000

This model uses a multi layer PCB which makes tracing runs very difficult. As a result it's possible that the drawing may a couple of errors or even more likely may be missing a couple of traces.

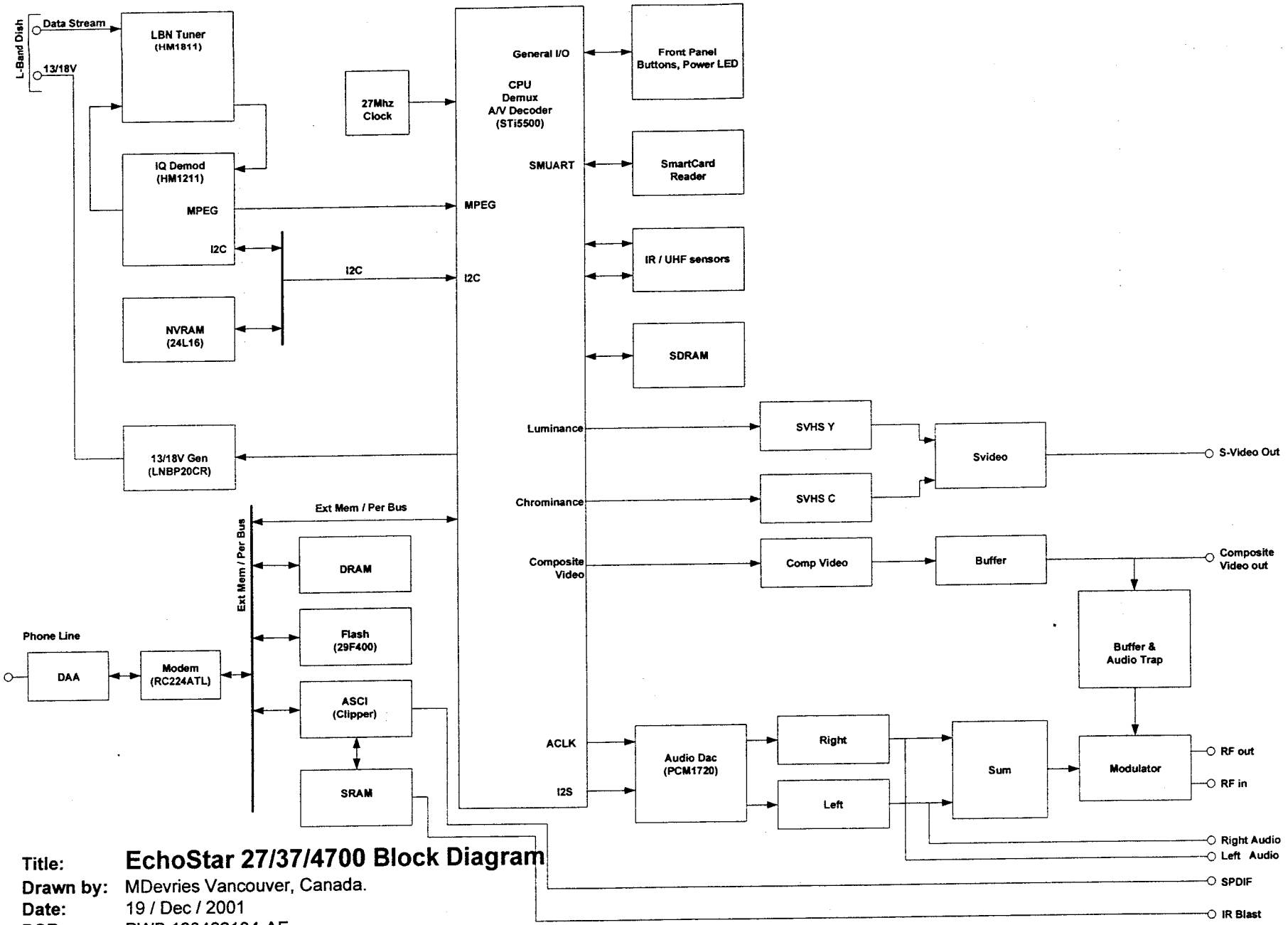
RCA DRD 420:

I emailed early beta copies of these schematics to a few friends on the net and within a couple hours two emailed me back with other schematics for this unit. While parts of these schematics are similar, other parts are quite different. This leads me to believe that there is at least two and maybe more versions of this model. So don't assume your 420 will match my schematics.

I'm also unable to e-mail or post copies of these other schematics as they were given to me in confidence and under the condition that I not spread them around.

On the PCB I used, only through hole components and ICs are labeled. This, in my opinion, is a very poor PCB design practice as it makes service very difficult, anyway this is why a lot of components on my drawings don't have labe's.

Another problem with my schematics for this model is I'm unable to draw up schematics of either the LNB tuner or the modulator, due to the lack to datasheets for the the ICs used in these sections.



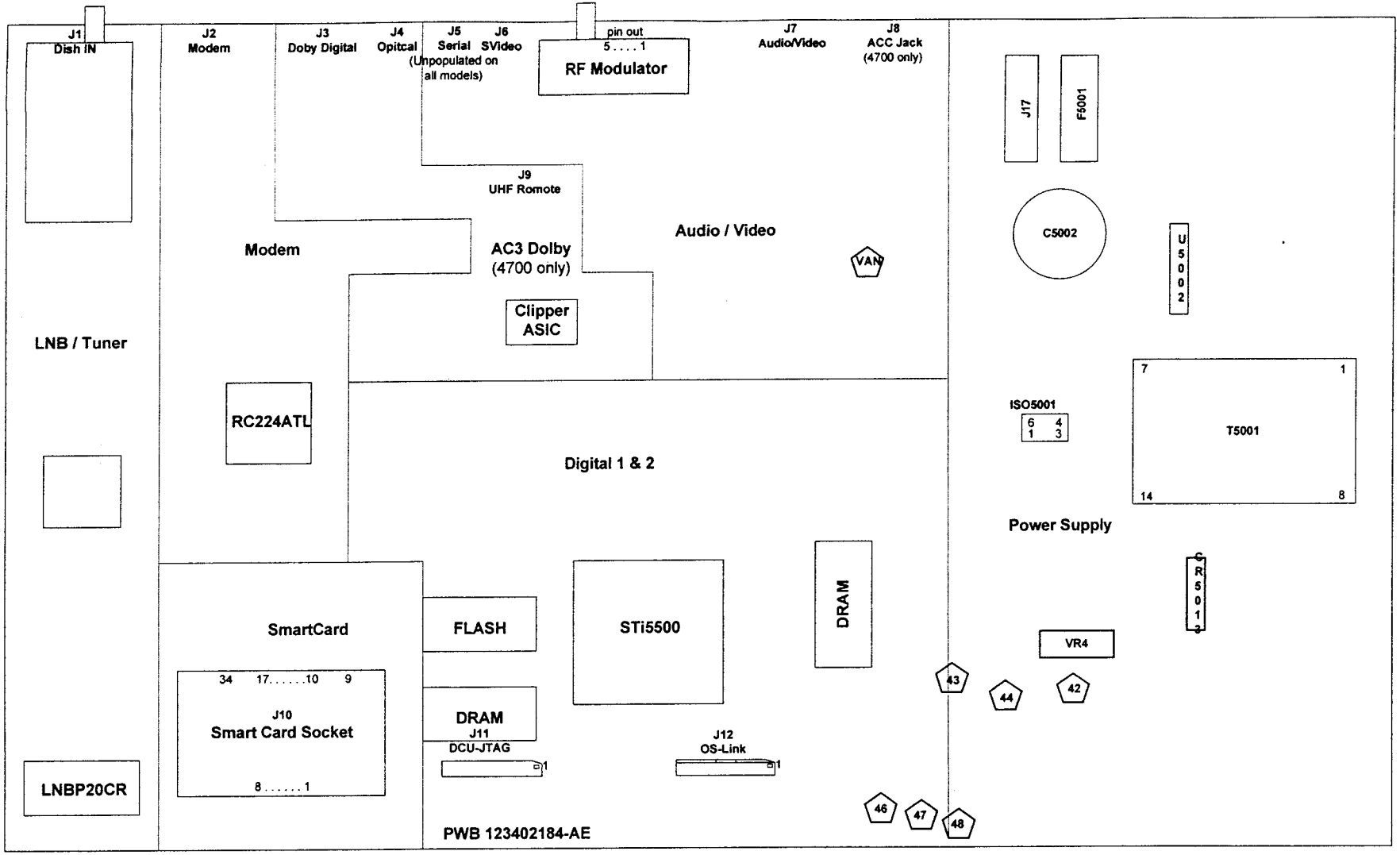
Title: **EchoStar 27/37/4700 Block Diagram**

Drawn by: MDevries Vancouver, Canada.

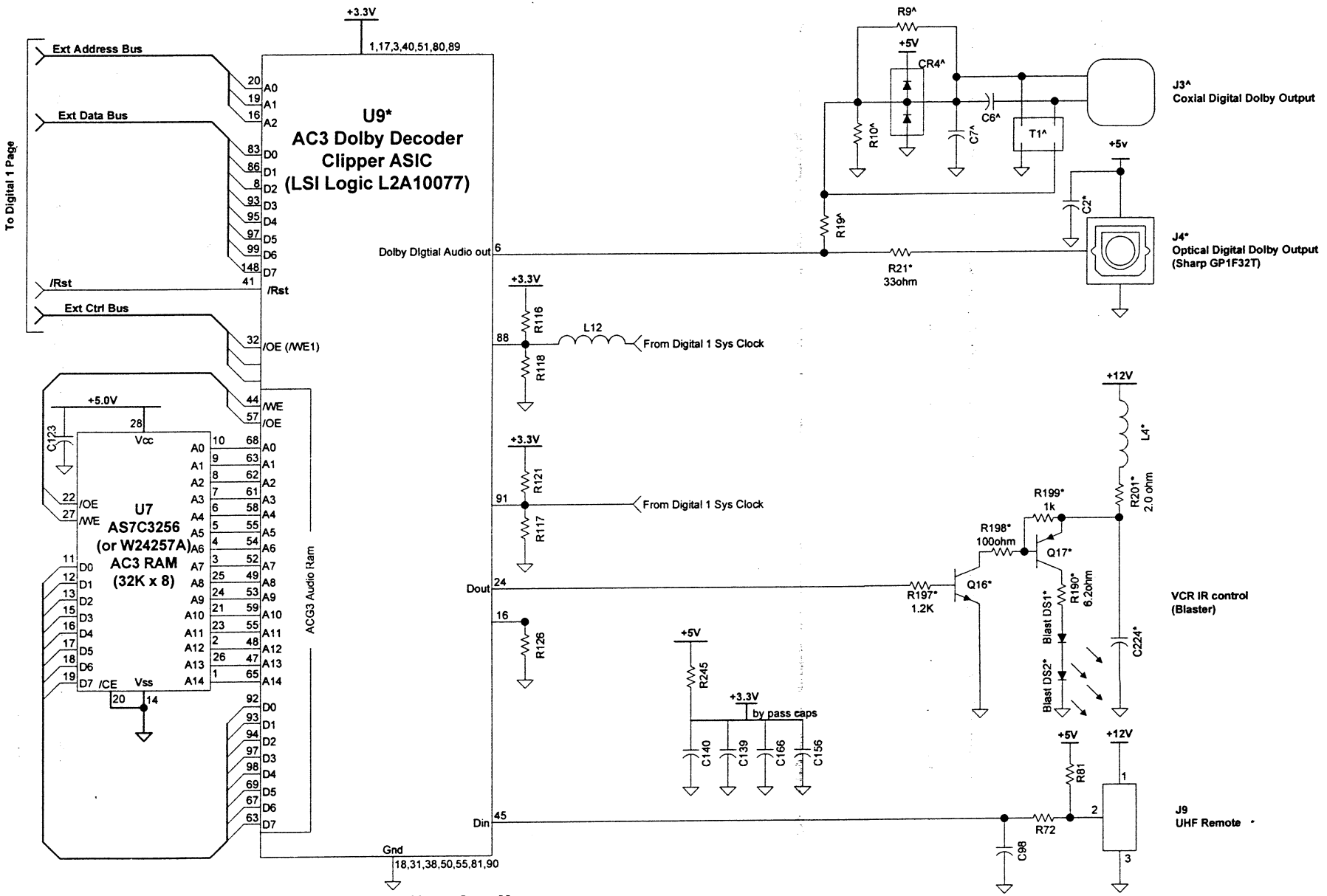
Date: 19 / Dec / 2001

PCB: PWB 123402184-AE

Comment: While this block diagram is for the 27/37/4700, it is general enough to fit most EchoStar receivers of a similar generation.



Title: **EchoStar 27/37/4700 rev C Parts Layout**
Drawn by: MDevries, Canada.
Date: 1 / Dec / 2001
PCB: PWB 123402184-AE
Comment: Parts layout of the EchoStar satellite receiver models 2700/3700/4700 used by Bell Express UV in Canada and by DishNet in the USA.



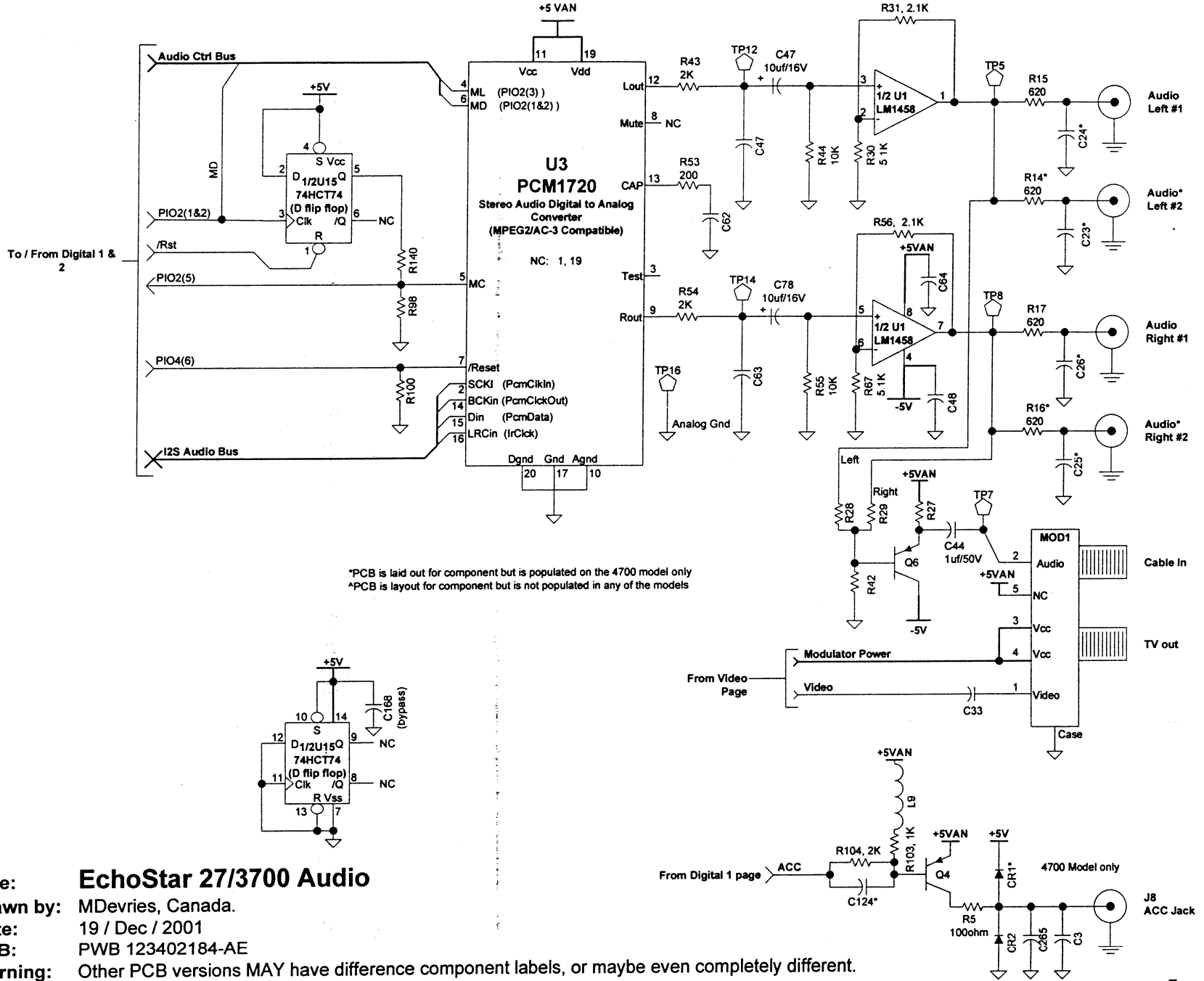
Title: **EchoStar 4700 - AC3 Dolby Audio**

Drawn by: MDevries, Canada.

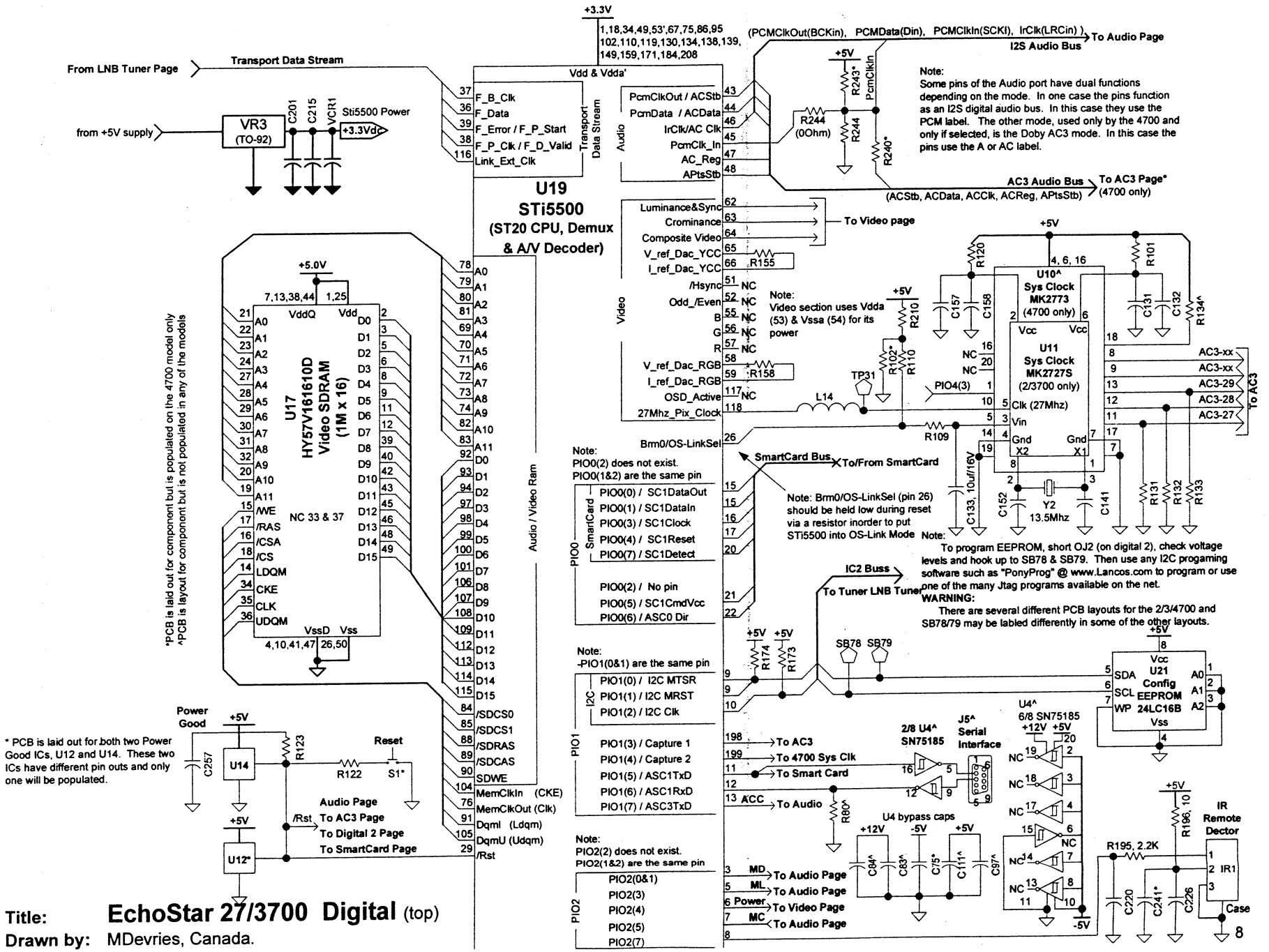
Date: 10 / Feb / 2002

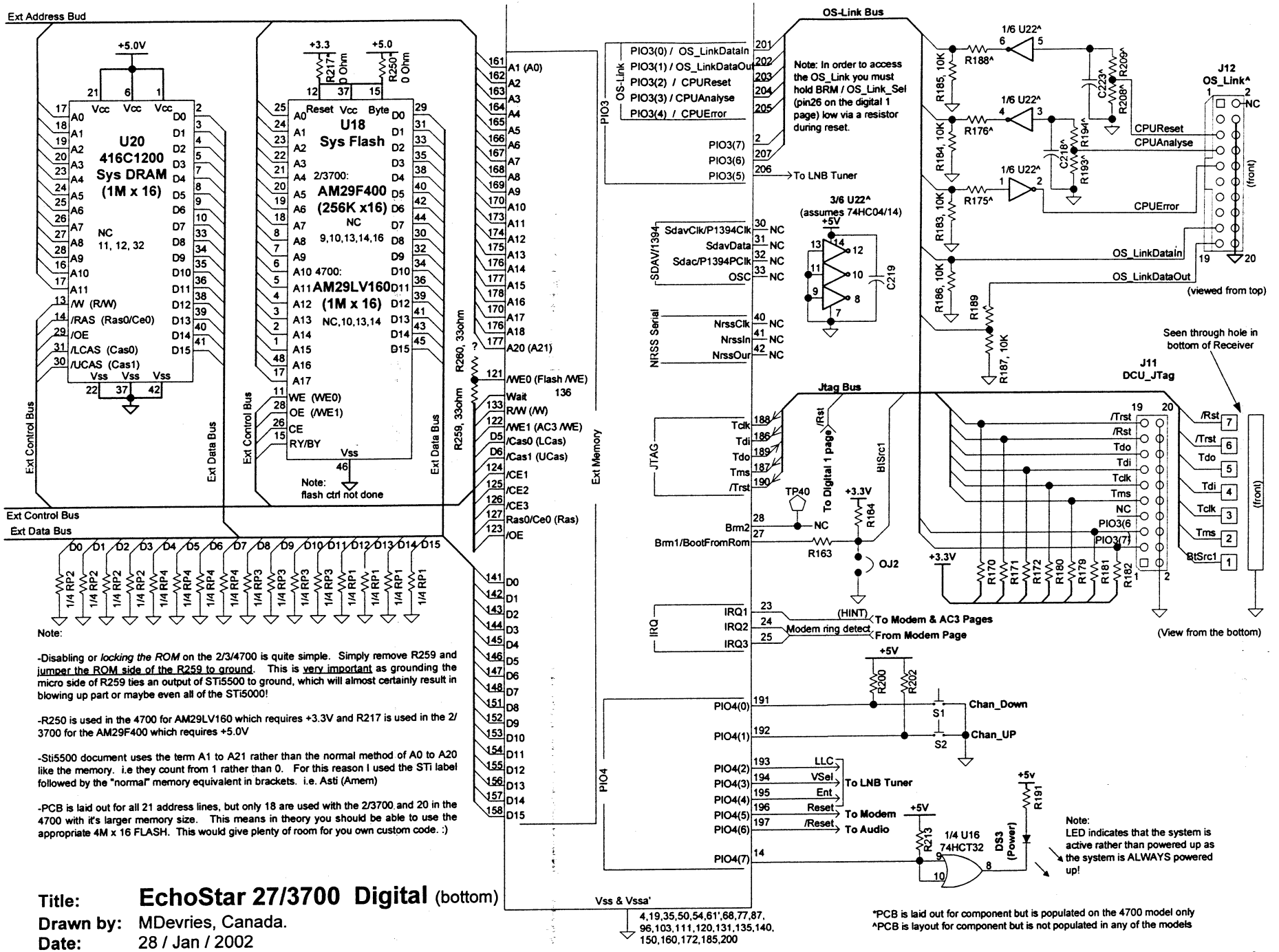
PCB: PWB 123402223-AE

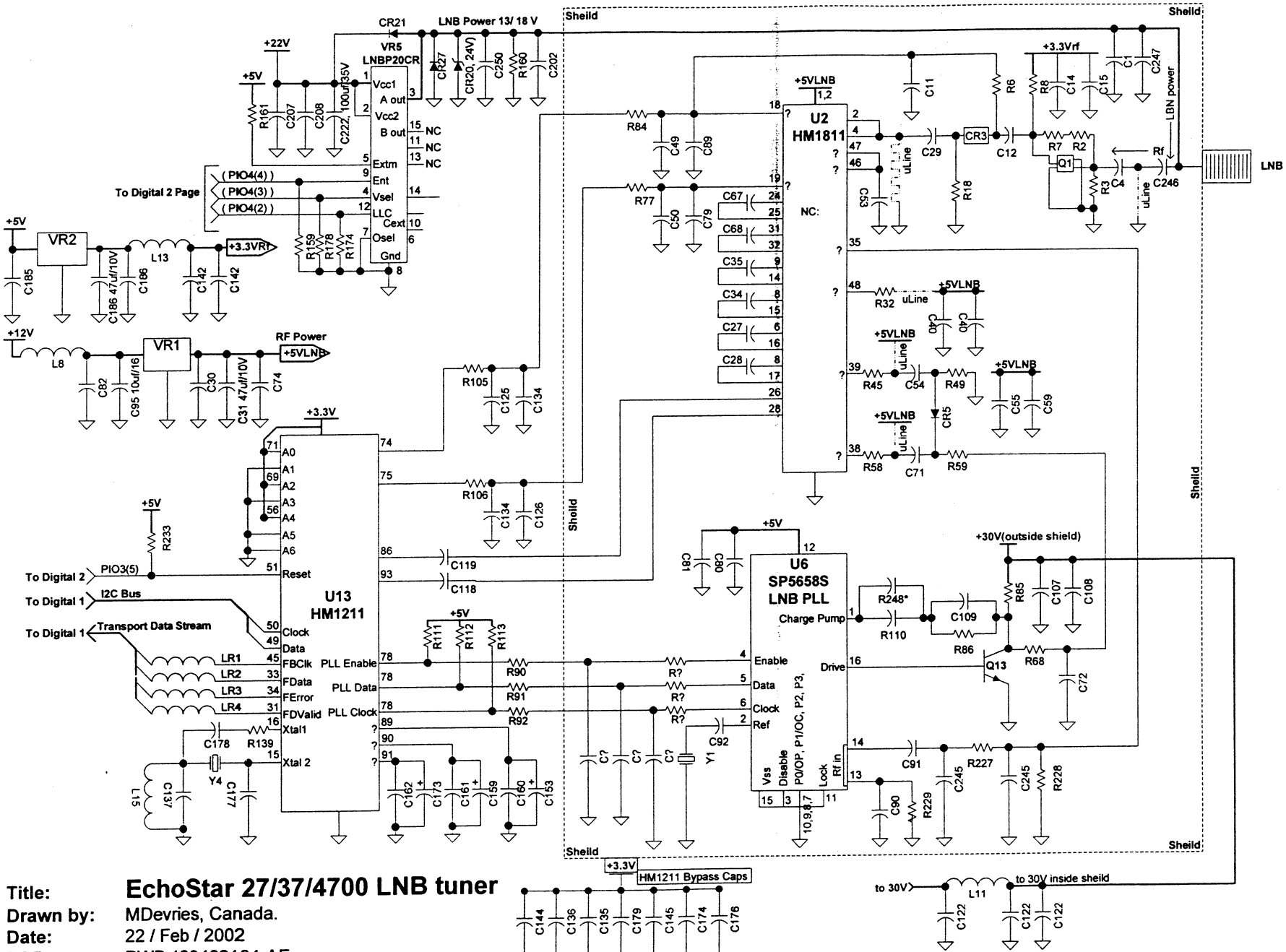
Comment: Note this schematic was draw based on the missing parts in a 2700 and is NOT complete and also MAY not be correct.



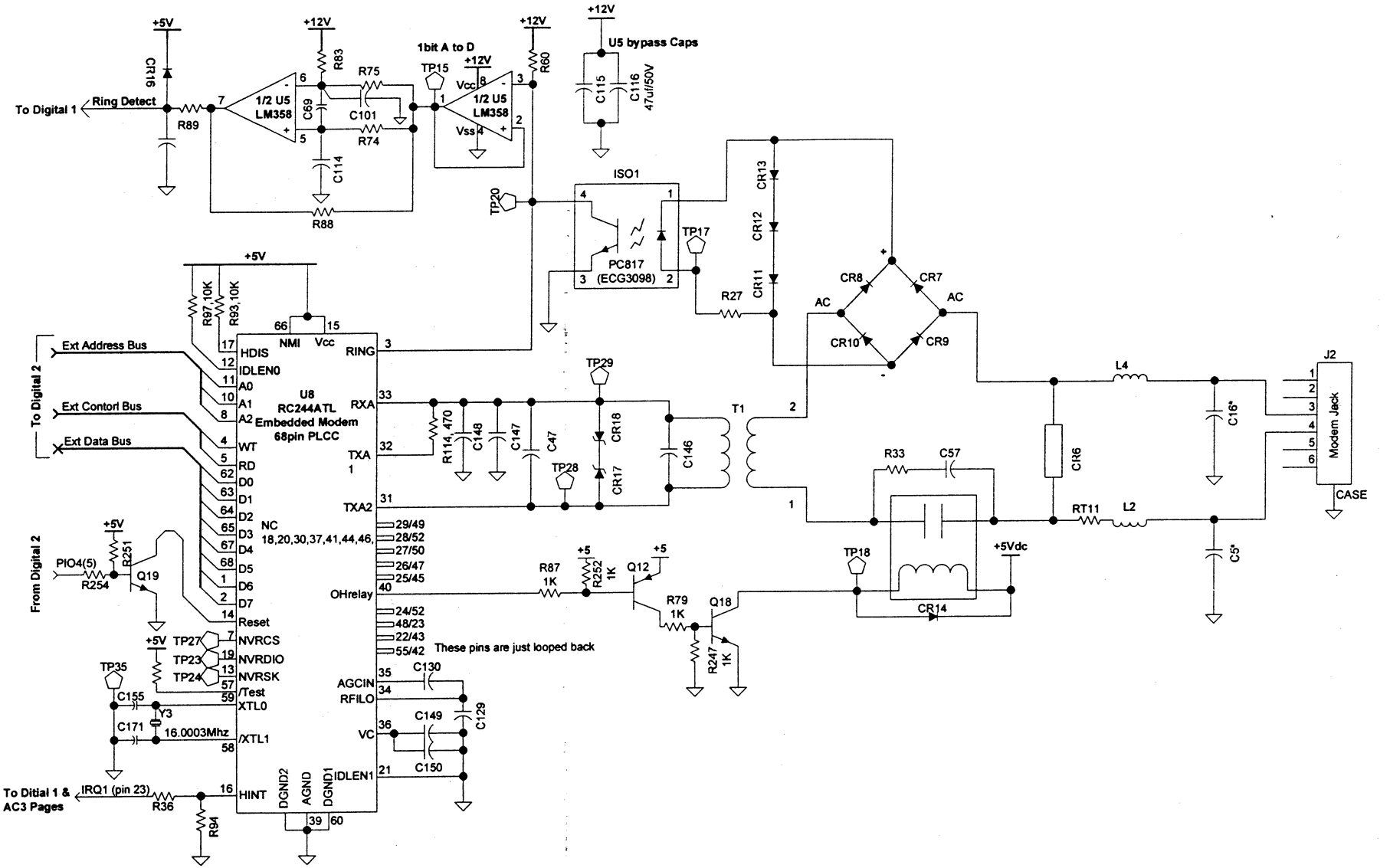
Title: **EchoStar 27/3700 Audio**
Drawn by: MDevries, Canada.
Date: 19 / Dec / 2001
PCB: PWB 123402184-AE
Warning: Other PCB versions MAY have difference component labels, or maybe even completely different.


From LNB Tuner Page
Transport Data Stream
from +5V supply
VR3
(TO-92)
C201
C215
VCR1
Sti5500 Power
+3.3Vdc
+3.3V
1,18,34,49,53',67,75,86,95
102,110,119,130,134,138,139,
149,159,171,184,208
Vdd & Vdda'
U19
STi5500
(ST20 CPU, Demux
& A/V Decoder)
F_B_Clk
F_Data
F_Error / F_P_Start
F_P_Clk / F_D_Valid
Link_Ext_Clk
Transport Data Stream
Audio
PcmClkOut / ACStb
PcmData / ACData
IrClk/AC Clk
PcmClk_In
AC_Reg
APtsStb
(PCMClkOut(BCKin), PCMData(Din), PCMClkIn(SCKI), IrClk(LRCin))
To Audio Page
I2S Audio Bus
Note:
Some pins of the Audio port have dual functions depending on the mode. In one case the pins function as an I2S digital audio bus. In this case they use the PCM label. The other mode, used only by the 4700 and only if selected, is the Doby AC3 mode. In this case the pins use the A or AC label.
R244
(0Ohm)
R243*
R240*
PcmClkIn
AC3 Audio Bus
To AC3 Page*
(4700 only)
(ACStb, ACData, ACClk, ACReg, APtsStb)
Luminance&Sync
Crominance
Composite Video
V_ref_Dac_YCC
I_ref_Dac_YCC
/Hsync
Odd_/Even
B
G
R
V_ref_Dac_RGB
I_ref_Dac_RGB
OSD_Active
27Mhz_Pix_Clock
Video
To Video page
R155
R158
Note:
Video section uses Vdda (53) & Vssa (54) for its power
R210
R102*
R110
TP31
L14
R109
Brm0/OS-LinkSel
SmartCard Bus
To/From SmartCard
Note: Brm0/OS-LinkSel (pin 26) should be held low during reset via a resistor inorder to put STi5500 into OS-Link Mode
+5V
R120
R101
U10^
Sys Clock
MK2773
(4700 only)
U11
Sys Clock
MK2727S
(2/3700 only)
PIO4(3)
Clk (27Mhz)
Vin
Gnd
Gnd
X2
X1
Y2
13.5Mhz
C157
C158
C131
C132
R134^
C133, 10uf/16V
C152
C141
R131
R132
R133
AC3-xx
AC3-xx
AC3-29
AC3-28
AC3-27
To AC3
Note:
To program EEPROM, short OJ2 (on digital 2), check voltage levels and hook up to SB78 & SB79. Then use any I2C progaming software such as "PonyProg" @ www.Lancos.com to program or use one of the many Jtag programs available on the net.
WARNING:
There are several different PCB layouts for the 2/3/4700 and SB78/79 may be labled differently in some of the other layouts.
IC2 Buss
To Tuner LNB Tuner
SB78
SB79
U21
Config
EEPROM
24LC16B
SDA
SCL
WP
Vcc
Vss
A0
A1
A2
U4^
6/8 SN75185
2/8 U4^
SN75185
J5^
Serial
Interface
R174
R173
Note:
PIO0(2) does not exist.
PIO0(1&2) are the same pin
PIO0
SmartCard
PIO0(0) / SC1DataOut
PIO0(1) / SC1DataIn
PIO0(3) / SC1Clock
PIO0(4) / SC1Reset
PIO0(7) / SC1Detect
PIO0(2) / No pin
PIO0(5) / SC1CmdVcc
PIO0(6) / ASC0 Dir
Note:
-PIO1(0&1) are the same pin
PIO1
I2C
PIO1(0) / I2C MTSR
PIO1(1) / I2C MRST
PIO1(2) / I2C Clk
PIO1(3) / Capture 1
PIO1(4) / Capture 2
PIO1(5) / ASC1TxD
PIO1(6) / ASC1RxD
PIO1(7) / ASC3TxD
To AC3
To 4700 Sys Clk
To Smart Card
To Audio
ACC
R80^
U4 bypass caps
+12V
-5V
+5V
C84^
C83^
C75^
C111^
C97^
Note:
PIO2(2) does not exist.
PIO2(1&2) are the same pin
PIO2
PIO2(0&1)
PIO2(3)
PIO2(4)
PIO2(5)
PIO2(7)
MD
ML
Power
MC
To Audio Page
To Audio Page
To Video Page
To Audio Page
R196, 10
R195, 2.2K
IR
Remote
Dector
IR1
Case
C220
C241*
C226
U17
HY57V161610D
Video SDRAM
(1M x 16)
+5.0V
7,13,38,44
1,25
VddQ
Vdd
NC 33 & 37
VssD
Vss
4,10,41,47
26,50
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
/WE
/RAS
/CSA
/CS
LDQM
CKE
CLK
UDQM
D0
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
Audio / Video Ram
/SDCS0
/SDCS1
/SDRAS
/SDCAS
SDWE
MemClkIn (CKE)
MemClkOut (Clk)
Dqml (Ldqm)
DqmU (Udqm)
/Rst
*PCB is laid out for component but is populated on the 4700 model only
^PCB is layout for component but is not populated in any of the models
Power
Good
+5V
C257
U14
R123
R122
Reset
S1*
Audio Page
/Rst To AC3 Page
To Digital 2 Page
To SmartCard Page
U12*
* PCB is laid out for both two Power Good ICs, U12 and U14. These two ICs have different pin outs and only one will be populated.
Title: EchoStar 27/3700 Digital (top)
Drawn by: MDevries, Canada.
8

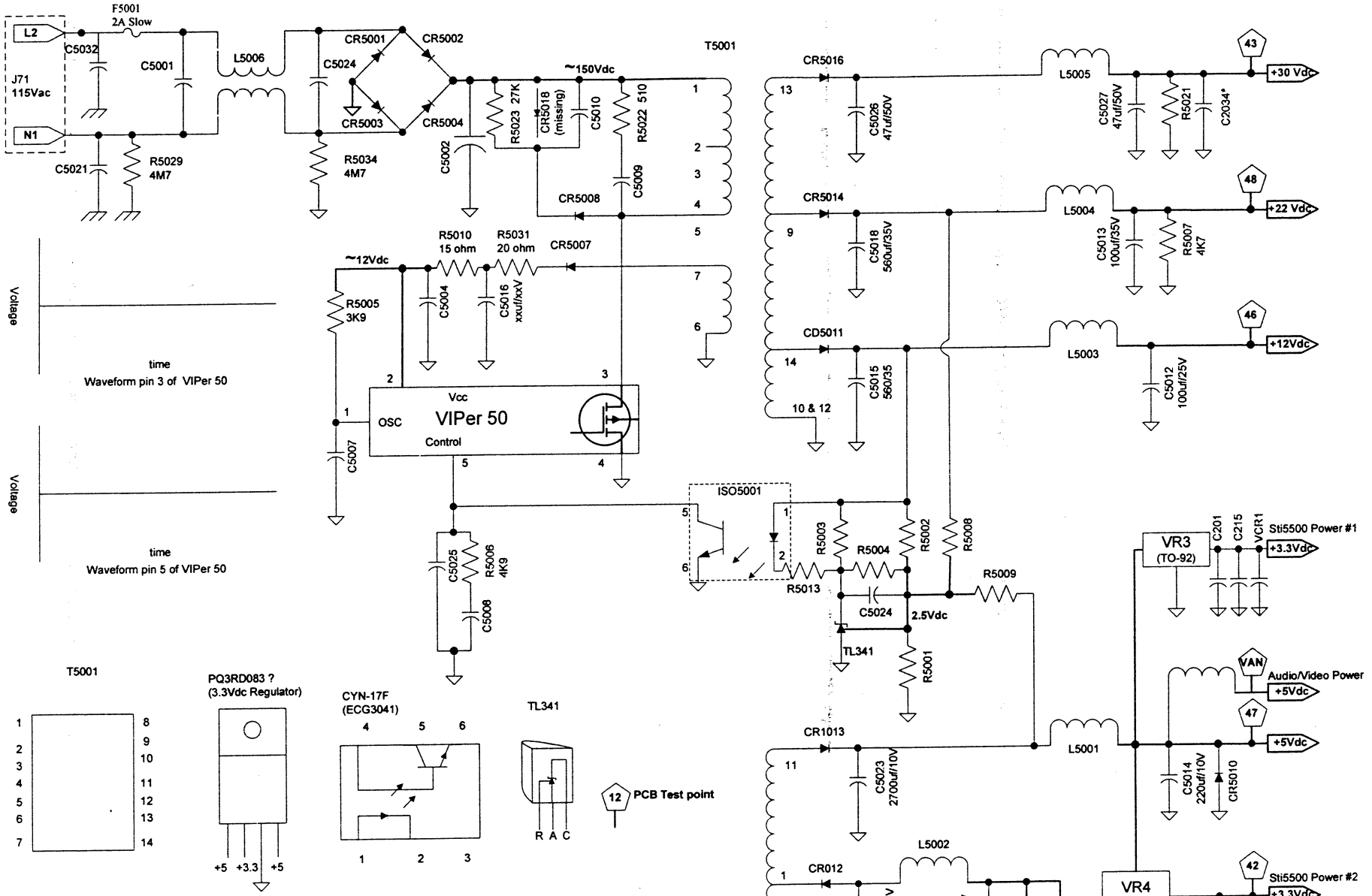

Ext Address Bud
U20
416C1200
Sys DRAM
(1M x 16)
U18
Sys Flash
AM29F400
(256K x16)
AM29LV160
(1M x 16)
Ext Control Bus
Ext Data Bus
Ext Memory
OS-Link Bus
Jtag Bus
Note: In order to access the OS_Link you must hold BRM / OS_Link_Sel (pin26 on the digital 1 page) low via a resistor during reset.
To LNB Tuner
To Digital 1 page
To Modem & AC3 Pages
From Modem Page
Modem ring detect
Chan_Down
Chan_UP
To Modem
To Audio
Seen through hole in bottom of Receiver
(viewed from top)
(View from the bottom)
Note:
-Disabling or locking the ROM on the 2/3/4700 is quite simple. Simply remove R259 and jumper the ROM side of the R259 to ground. This is very important as grounding the micro side of R259 ties an output of STi5500 to ground, which will almost certainly result in blowing up part or maybe even all of the STi5000!
-R250 is used in the 4700 for AM29LV160 which requires +3.3V and R217 is used in the 2/3700 for the AM29F400 which requires +5.0V
-Sti5500 document uses the term A1 to A21 rather than the normal method of A0 to A20 like the memory. i.e they count from 1 rather than 0. For this reason I used the STi label followed by the "normal" memory equivalent in brackets. i.e. Asti (Amem)
-PCB is laid out for all 21 address lines, but only 18 are used with the 2/3700 and 20 in the 4700 with it's larger memory size. This means in theory you should be able to use the appropriate 4M x 16 FLASH. This would give plenty of room for you own custom code. :)
Title: EchoStar 27/3700 Digital (bottom)
Drawn by: MDevries, Canada.
Date: 28 / Jan / 2002
PCB: PWB 123402184-AE
*PCB is laid out for component but is populated on the 4700 model only
^PCB is layout for component but is not populated in any of the models



Title: **EchoStar 27/37/4700 LNB tuner**
Drawn by: MDevries, Canada.
Date: 22 / Feb / 2002
PCB: PWB 123402184-AE
Comment: Drawn with out the aid of datat sheets so I had no way to cross check, as a result don't assume anything on this page is correct.



Title: **EchoStar 27/37/4700 Modem**
Drawn by: MDevries, Canada.
Date: 9/ Jan / 2002
PCB: 123402184-AE



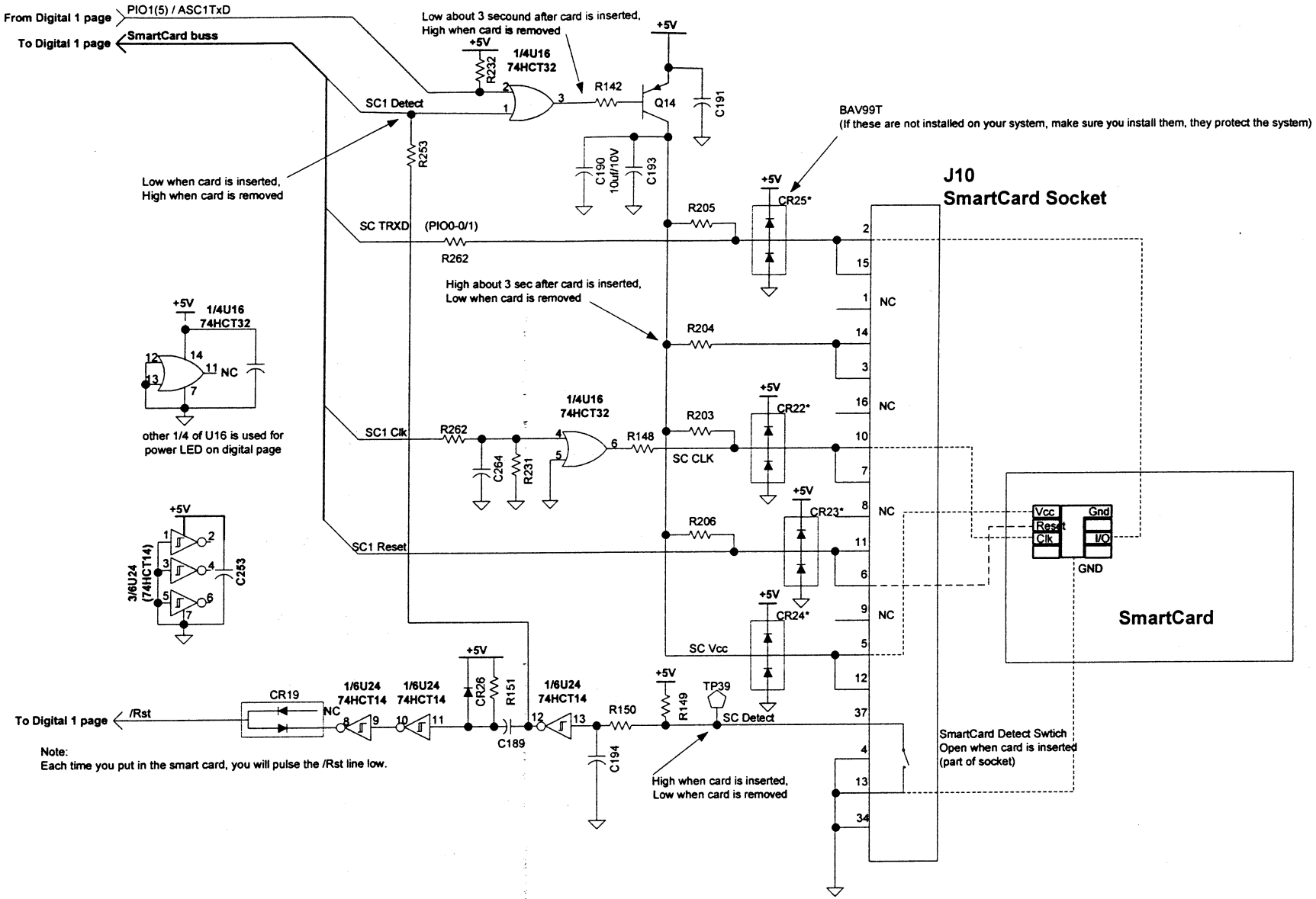
Title: **EchoStar 27/37/4700 rev C Power Supply**

Drawn by: MDevries, Canada.

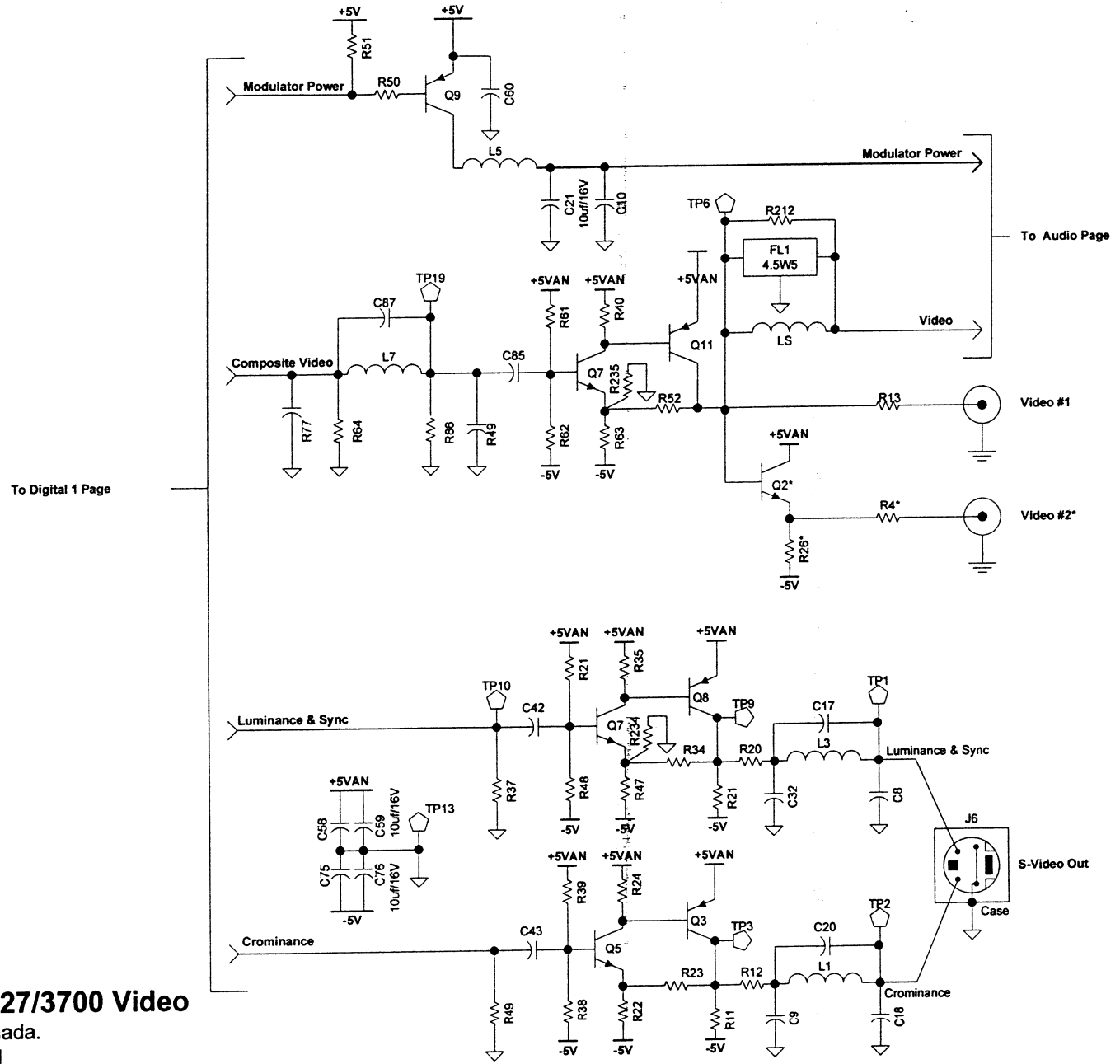
Date: 1 / Dec / 2001

PCB: PWB 123402184-AE

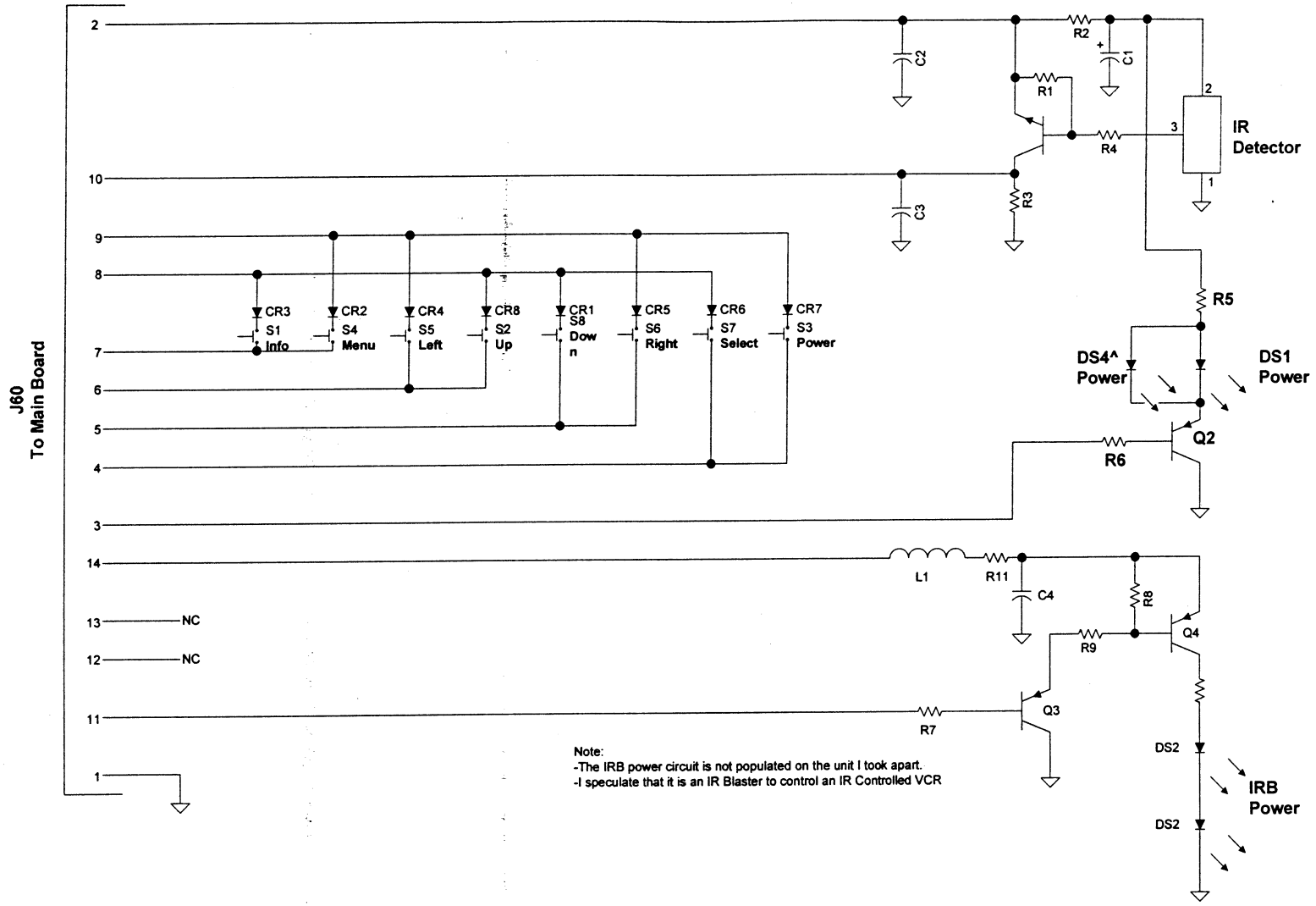
Warning: Other PCB versions may have different component labels or maybe even be completely different.



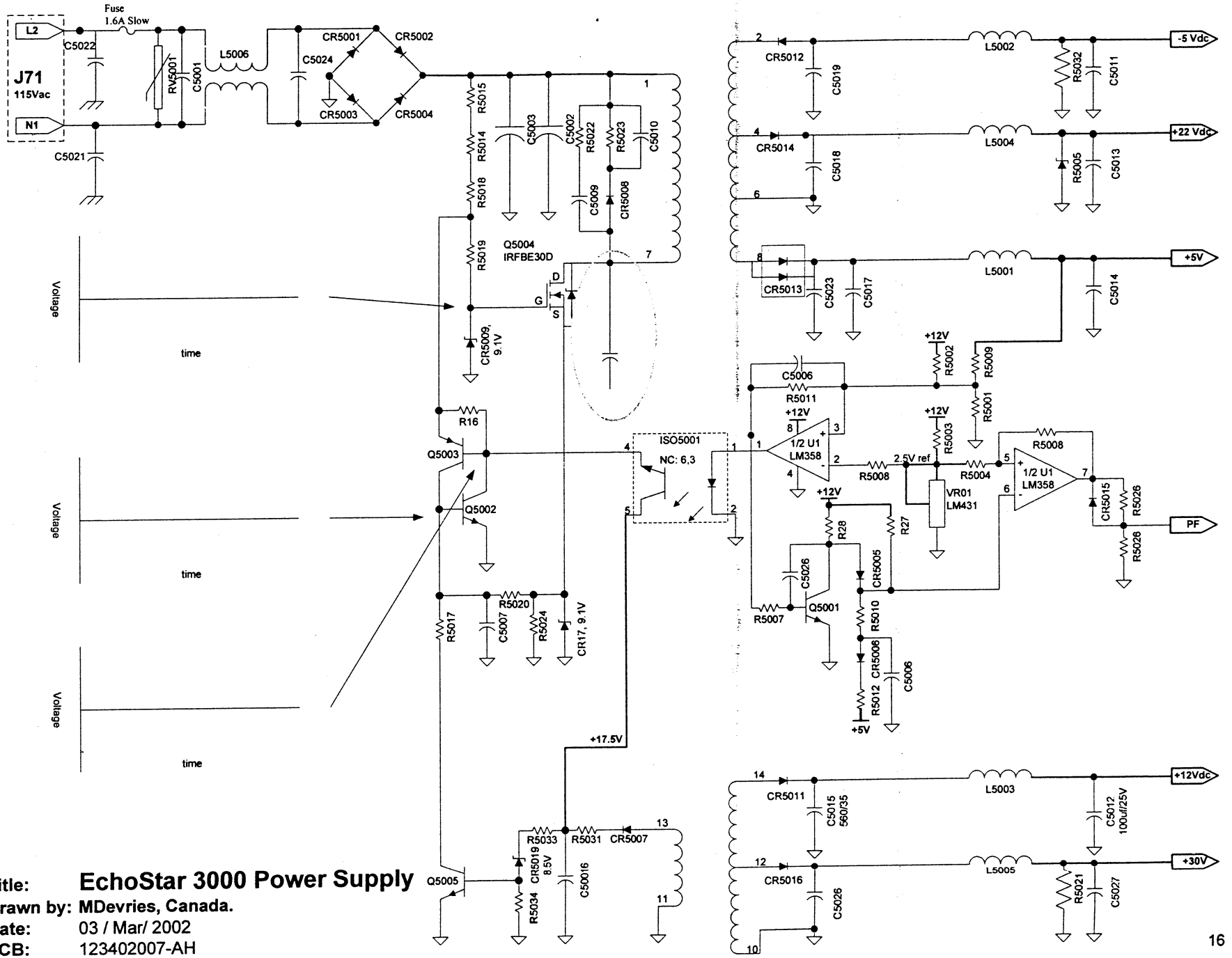
Title: **EchoStar 27/37/4700 SmartCard Reader**
Drawn by: MDevries, Canada.
Date: 20 / Jan / 2002
PCB: PWB 123402184-AE
Warning: Other PCB versions may have different component labels or maybe even be completely different.



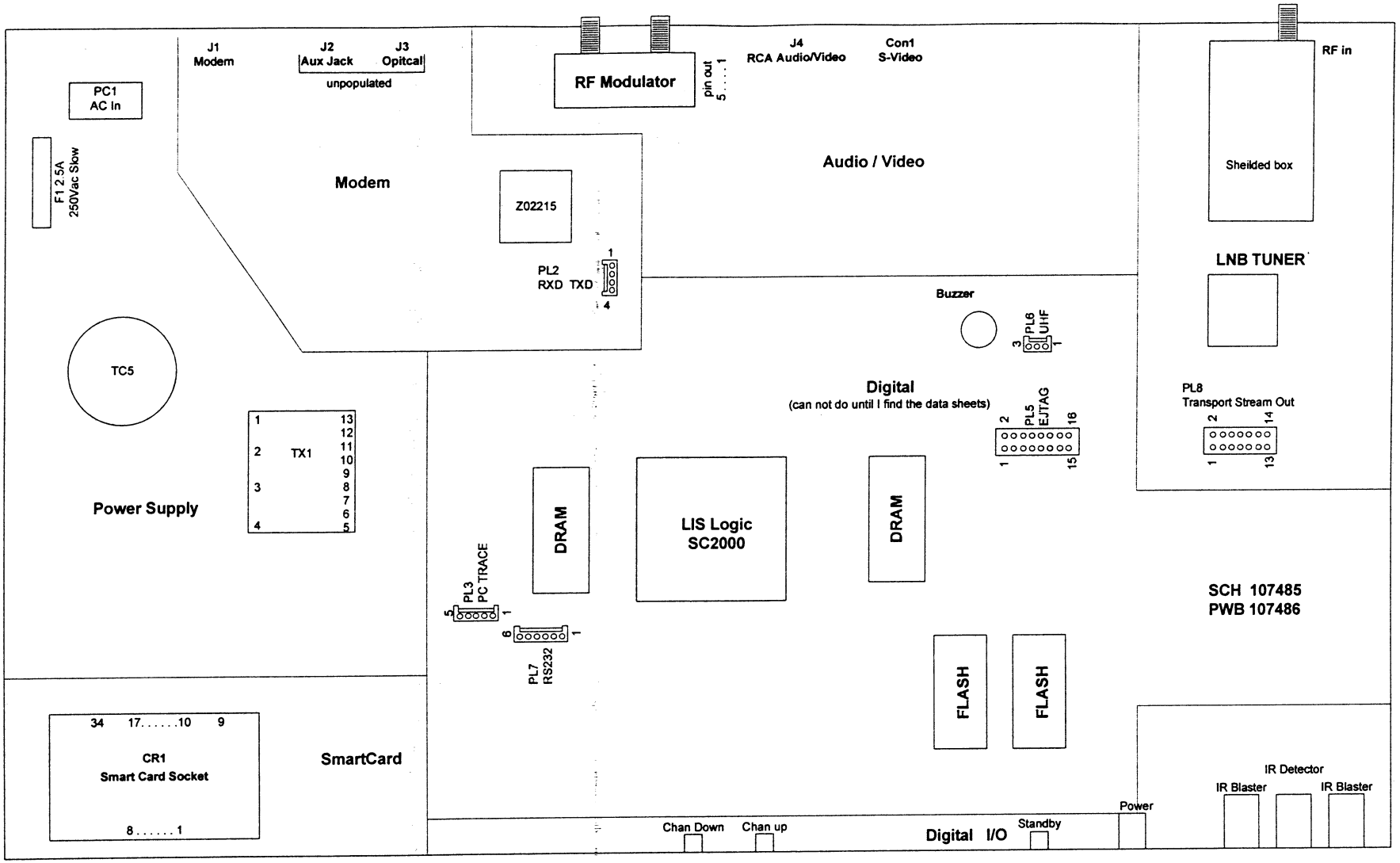
Title: **EchoStar 27/3700 Video**
Drawn by: MDevries, Canada.
Date: 19 / Dec / 2001
PCB: PWB 123402184-AE
Warning: Other PCB versions MAY have difference component labels, or maybe even completely different.



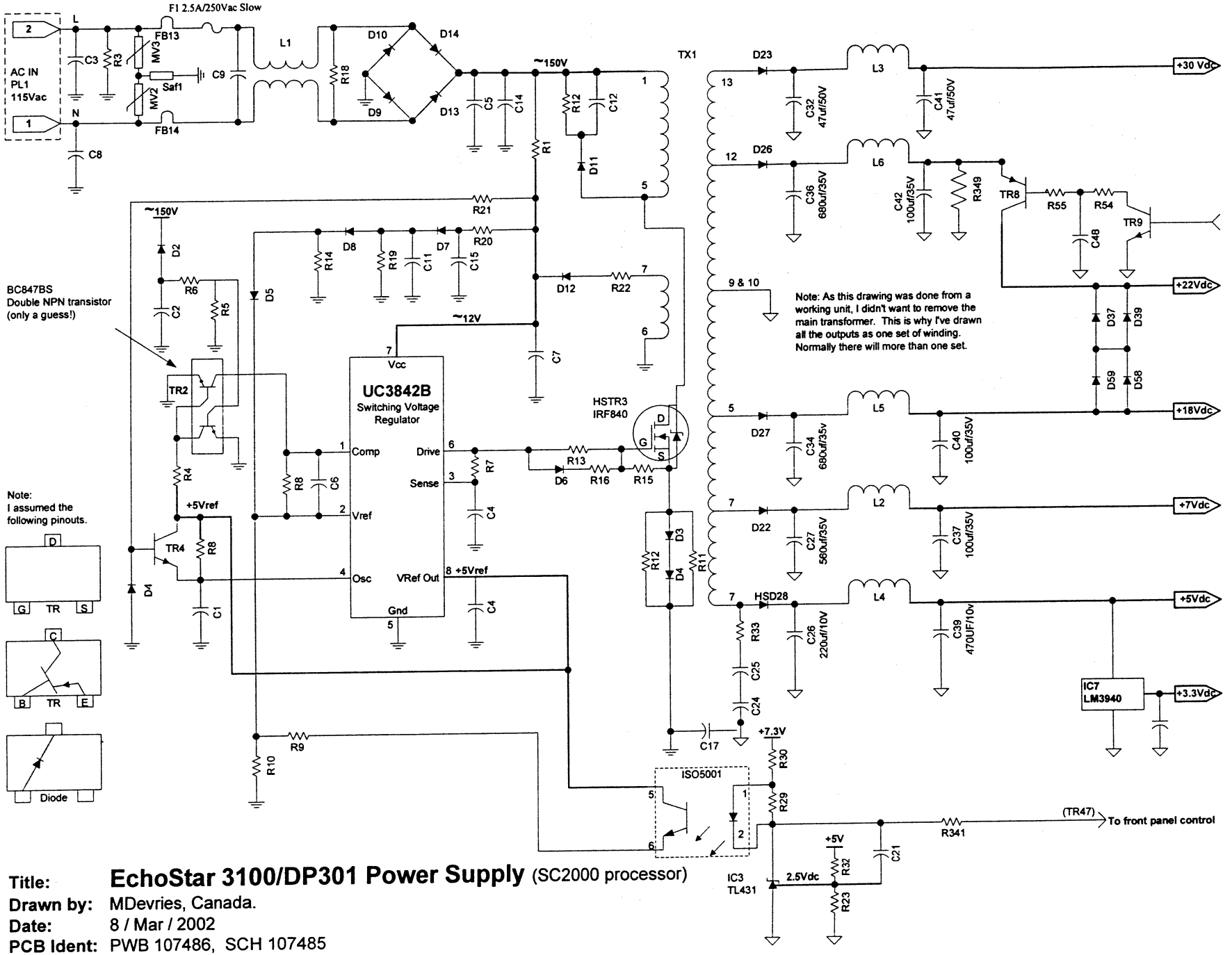
Title: **EchoStar 3000 Front Panel PCB**
Drawn by: MDevries, Canada.
Date: 25 / Feb / 2002
PCB: PWB 123402097-AA



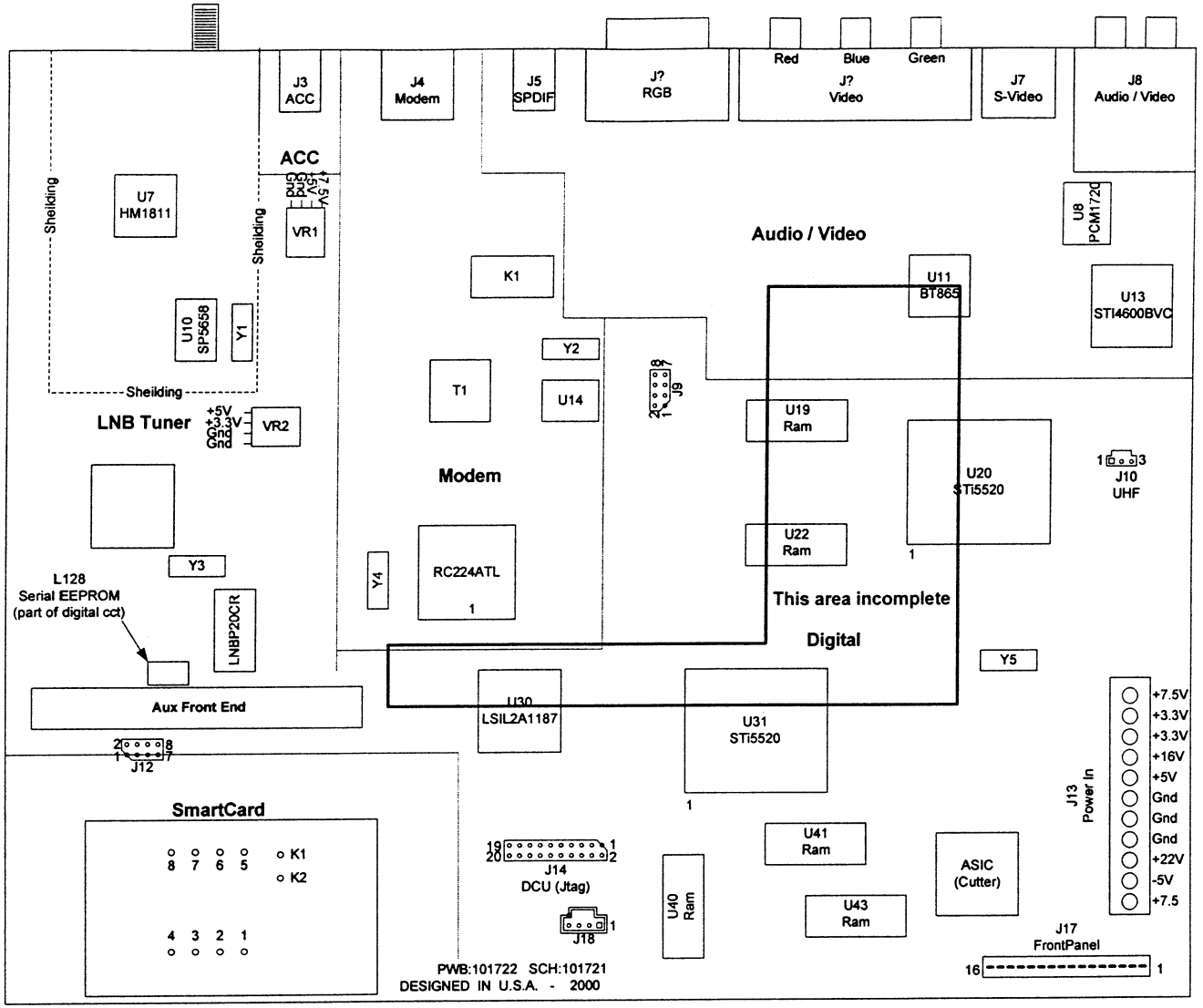
Title: **EchoStar 3000 Power Supply**
Drawn by: **MDevries, Canada.**
Date: 03 / Mar/ 2002
PCB: 123402007-AH



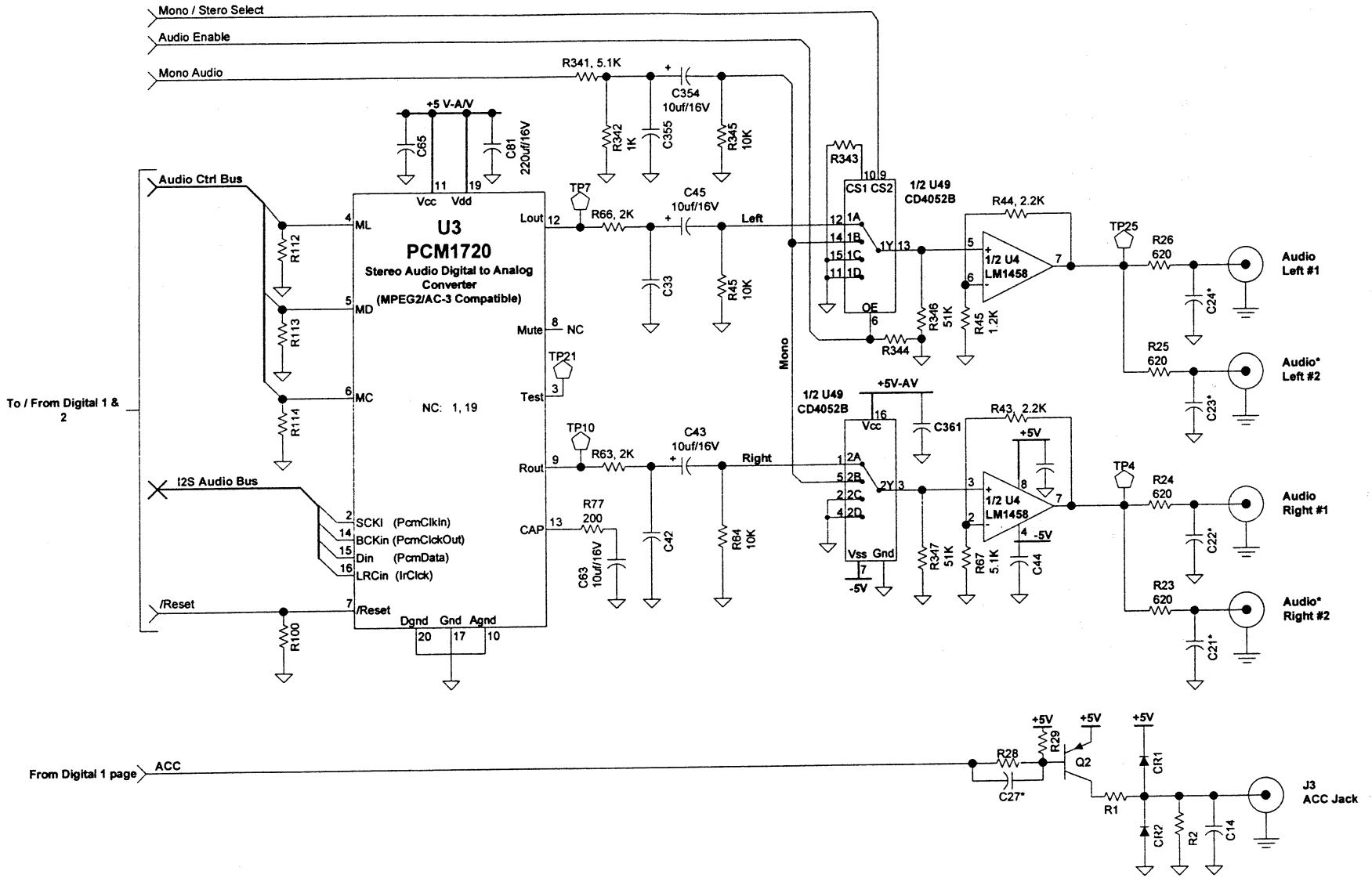
Title: **EchoStar 3100 / DP301 Parts Layout** (with SC2000 processor)
Drawn by: MDevries, Canada.
Date: 5 / Mar / 2002
PCB Ident: PWB 107486, SCH 107485
Comment: This is the parts layout of the EchoStar satellite receiver, model 3100 used by Bell Express UV in Canada and model DP301 used by DishNet in the USA.



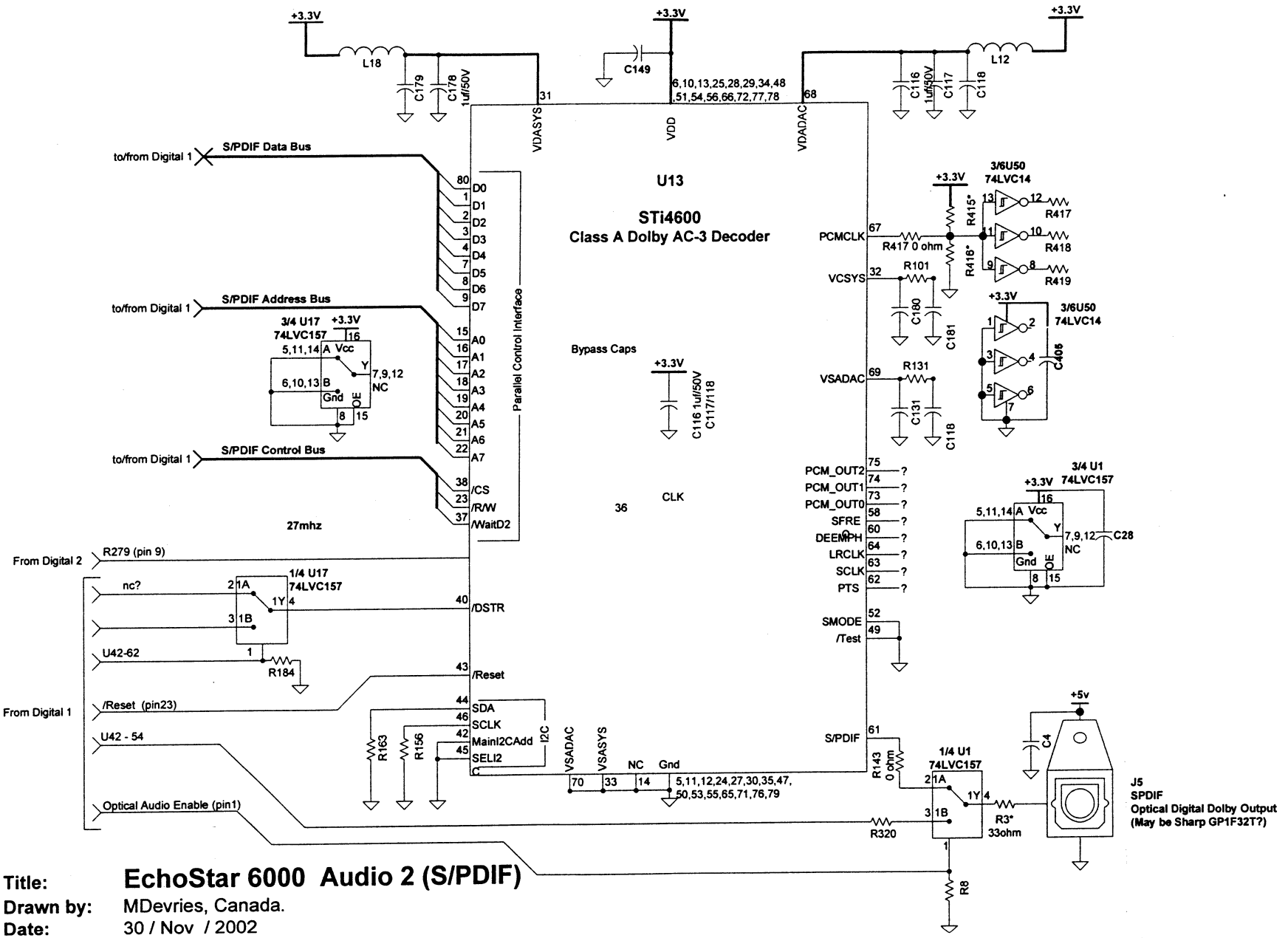
Title: **EchoStar 3100/DP301 Power Supply** (SC2000 processor)
Drawn by: MDevries, Canada.
Date: 8 / Mar / 2002
PCB Ident: PWB 107486, SCH 107485



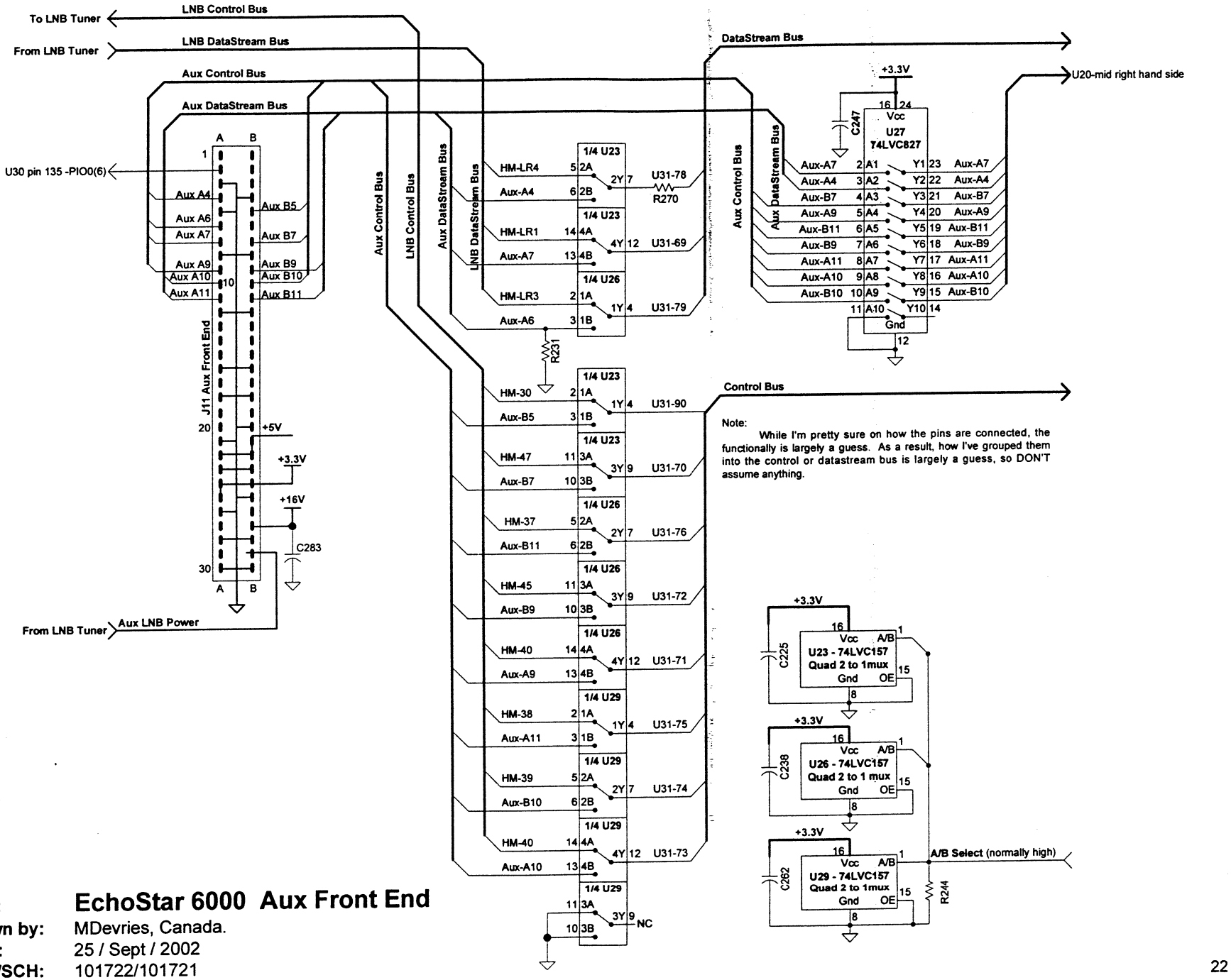
Title: **EchoStar 6000 Parts Layout**
Drawn by: MDevries, Canada.
Date: 1 / Aug / '02
PCB: 101722
SCH: 101721



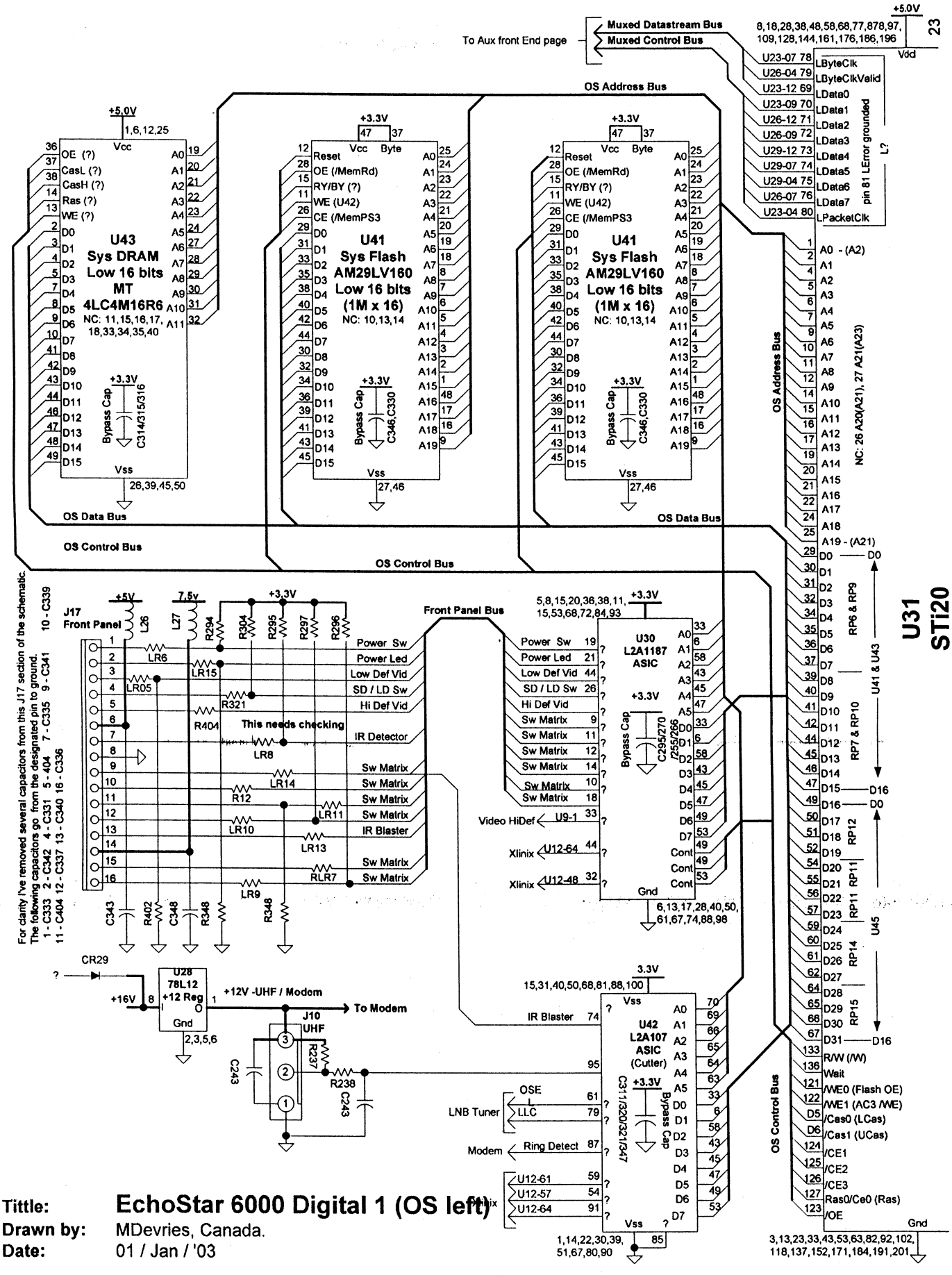
Title: **EchoStar 6000 Audio 1 (Stereo)**
Drawn by: MDevries, Canada.
Date: 05 / Oct / 2002
PCB/SCH: 101722/101721



Title: **EchoStar 6000 Audio 2 (S/PDIF)**
Drawn by: MDevries, Canada.
Date: 30 / Nov / 2002
PCB: 101722
SCH: 101721



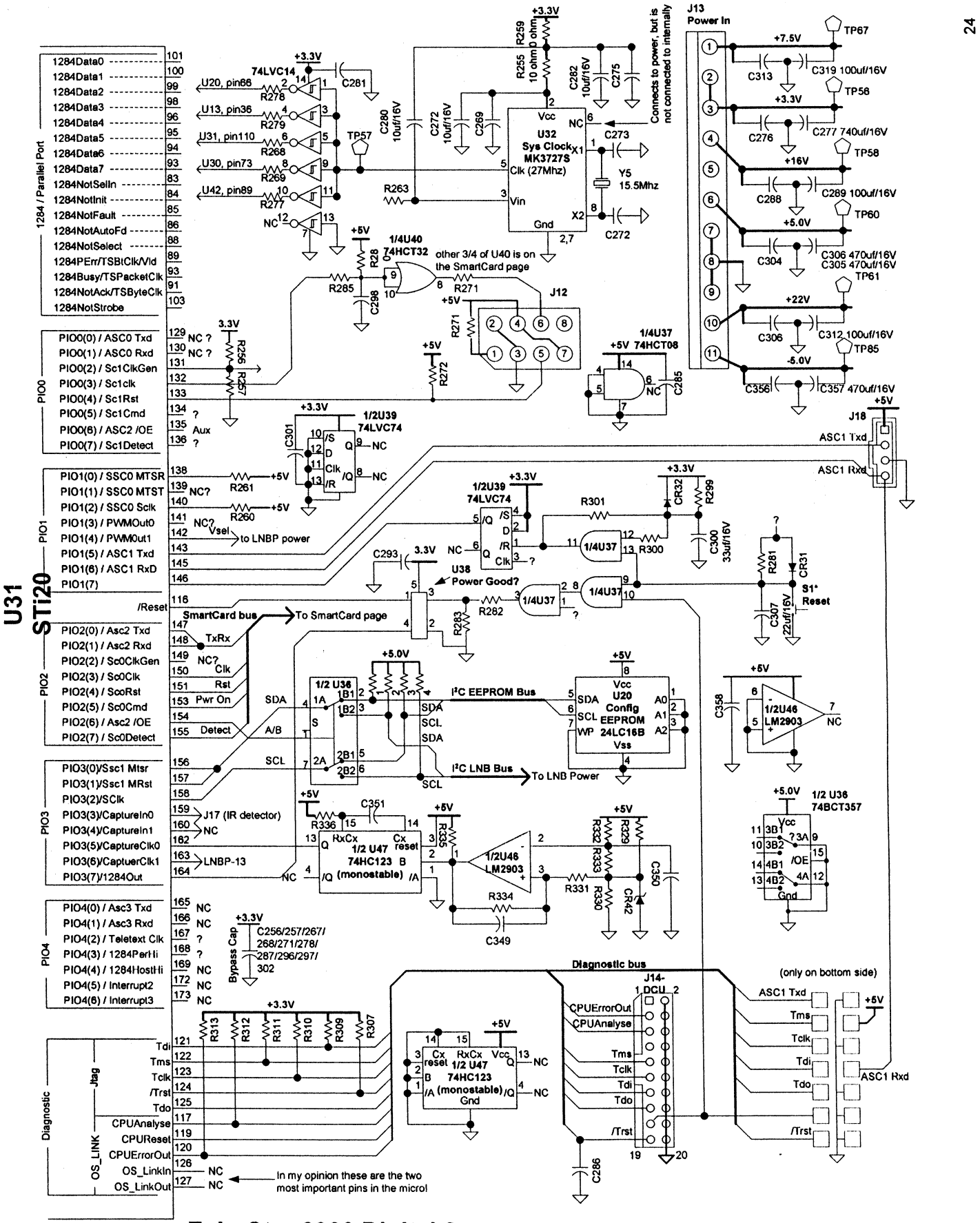
Title: **EchoStar 6000 Aux Front End**
Drawn by: MDevries, Canada.
Date: 25 / Sept / 2002
PCB/SCH: 101722/101721



Tittle: **EchoStar 6000 Digital 1 (OS left)**

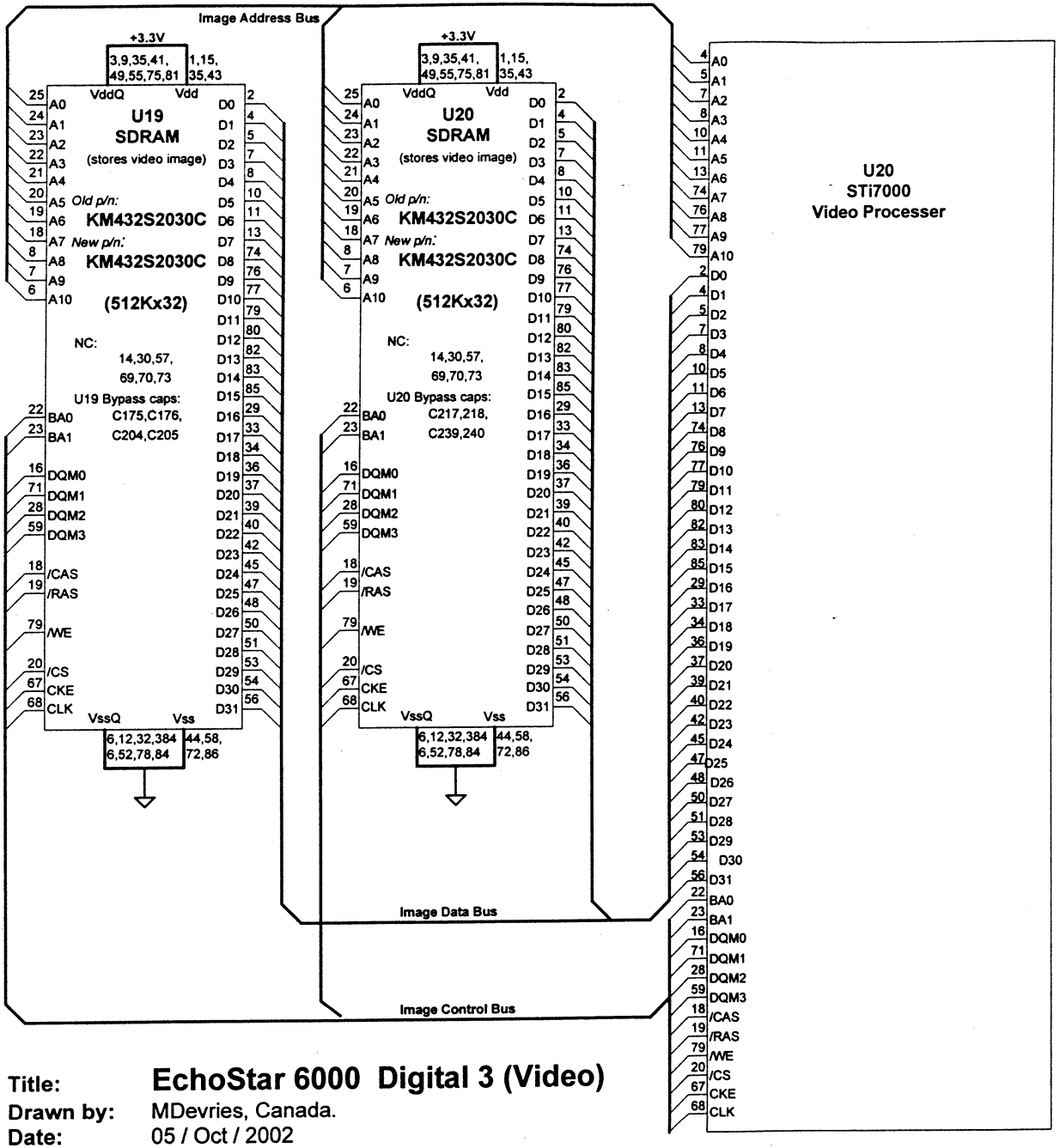
Drawn by: MDevries, Canada.

Date: 01 / Jan / '03

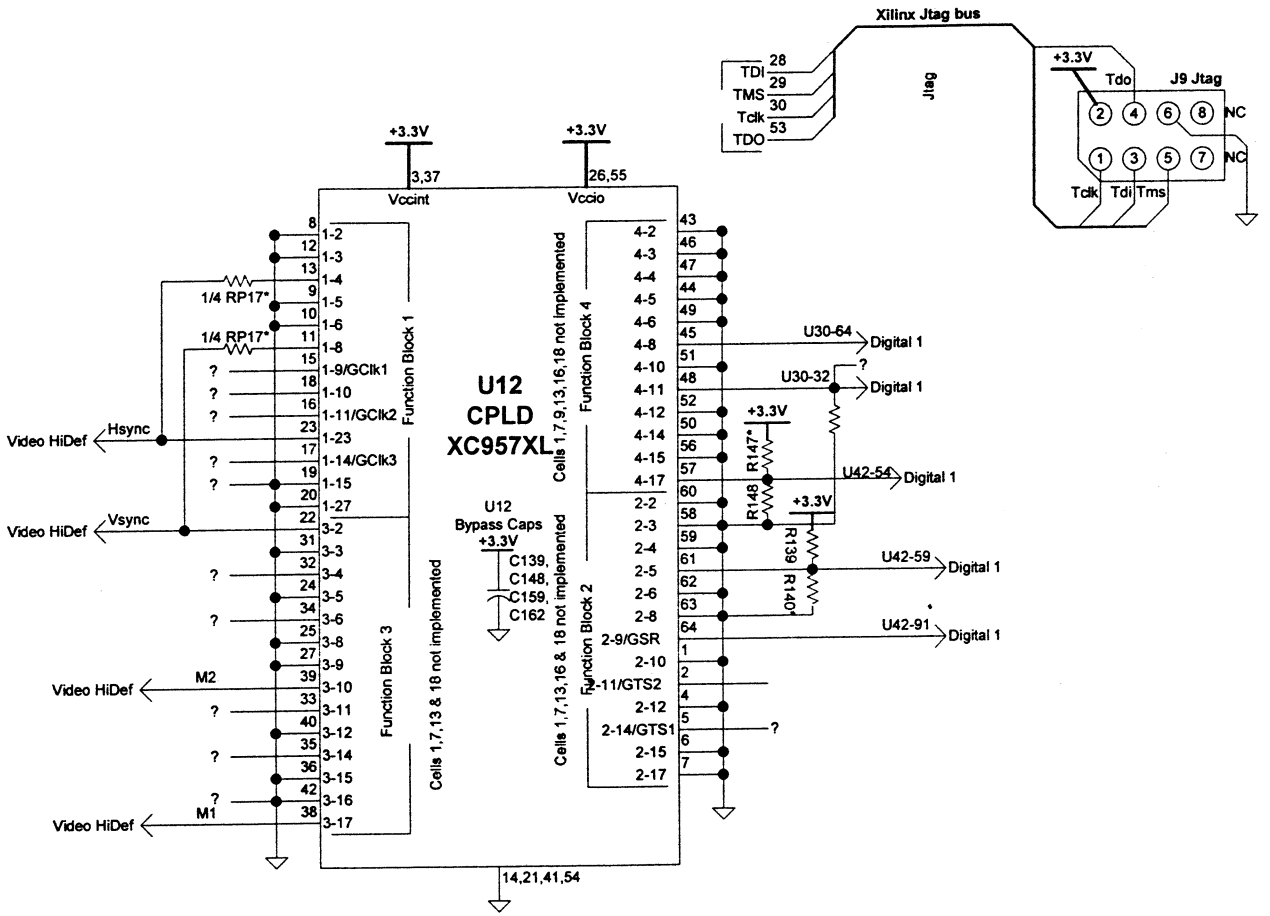


EchoStar 6000 Digital 2 (OS Right)

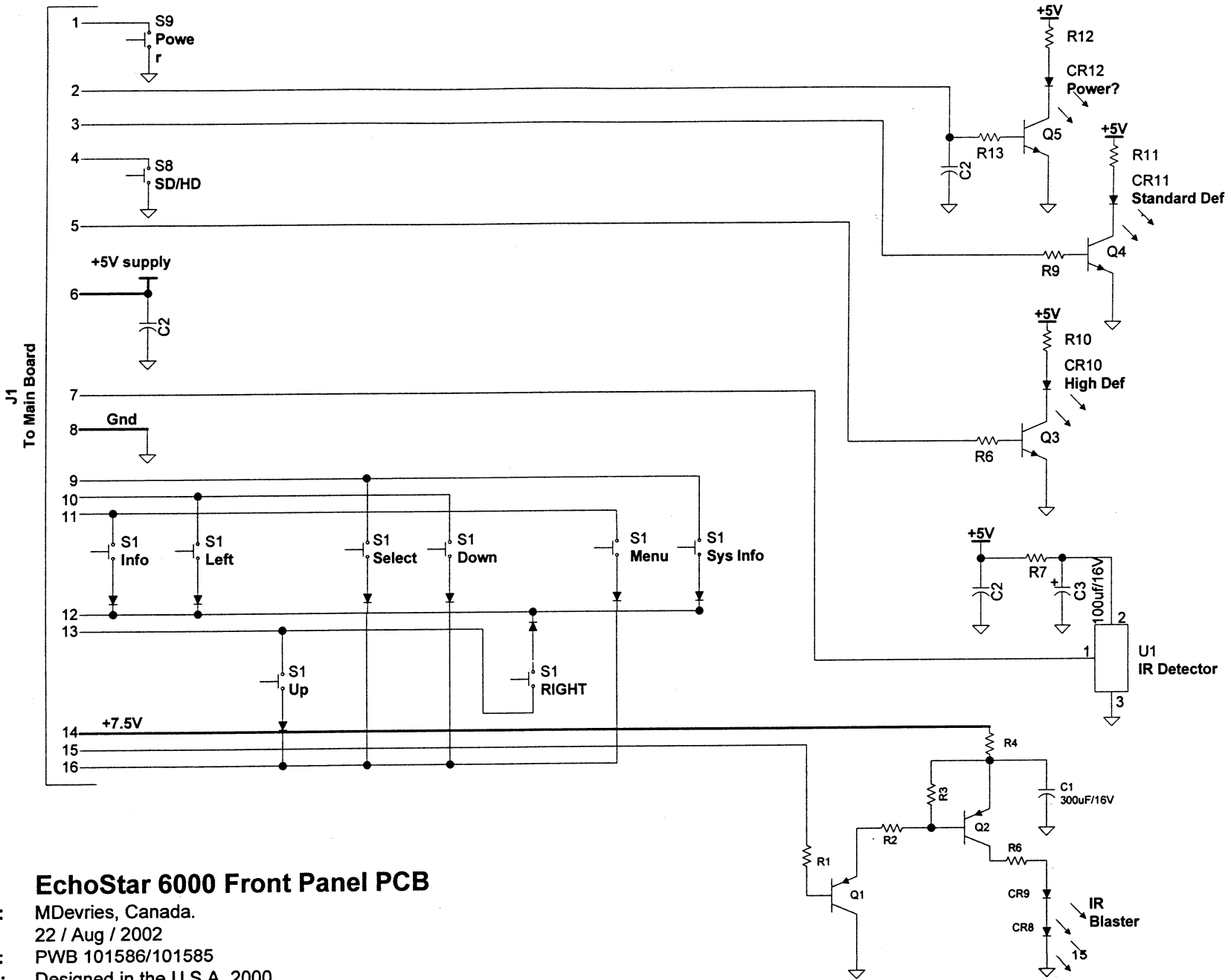
by Mdevries



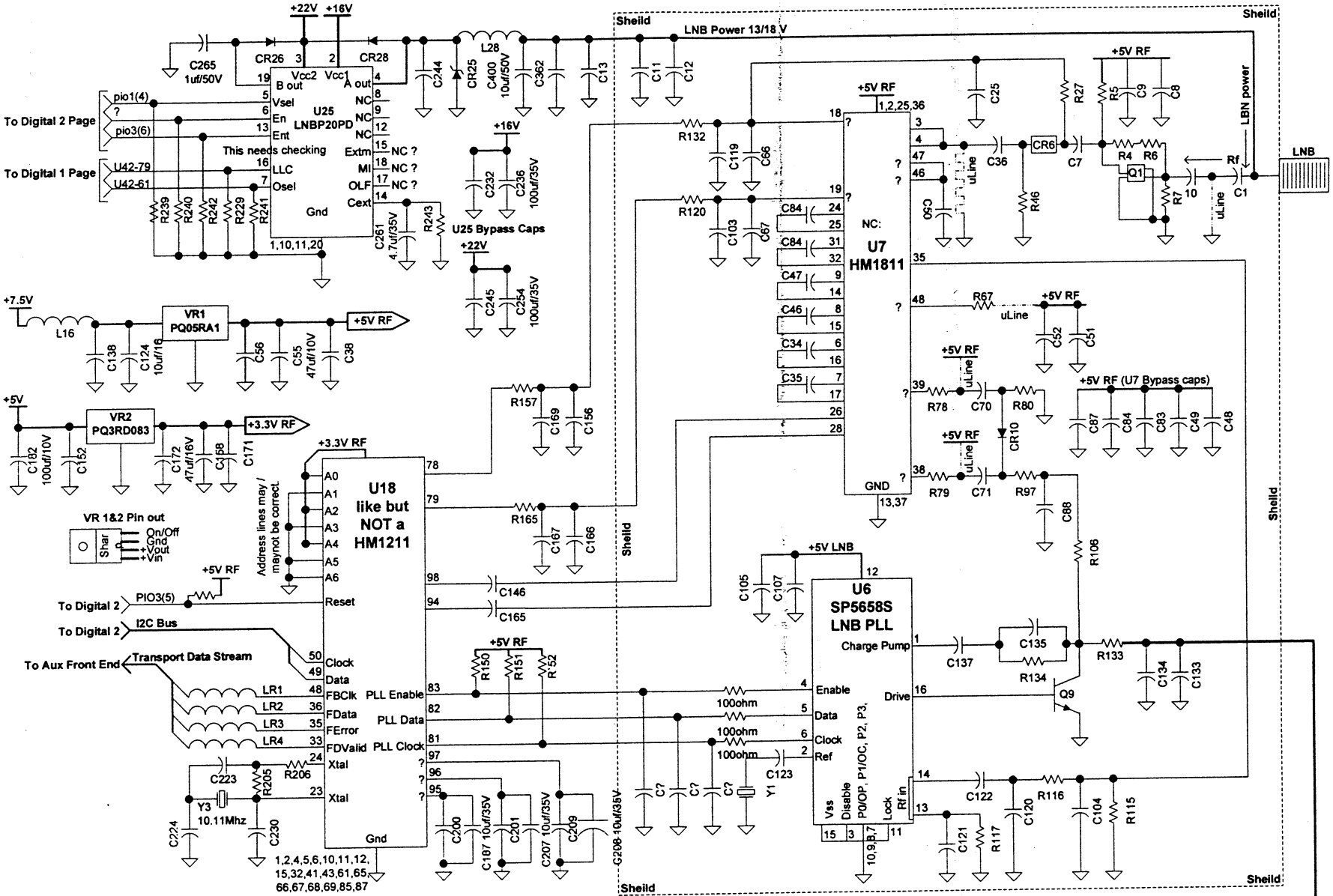
Title: **EchoStar 6000 Digital 3 (Video)**
Drawn by: MDevries, Canada.
Date: 05 / Oct / 2002
PCB/SCH: 101722/101721



Title: **EchoStar 6000 Digtial 4** (Xlinx)
Drawn by: MDevries, Canada.
Date: 25 / Feb / 2003
PCB/SCH: 101722/101721



Title: **EchoStar 6000 Front Panel PCB**
Drawn by: MDevries, Canada.
Date: 22 / Aug / 2002
PCB/SCH: PWB 101586/101585
Comment: Designed in the U.S.A. 2000



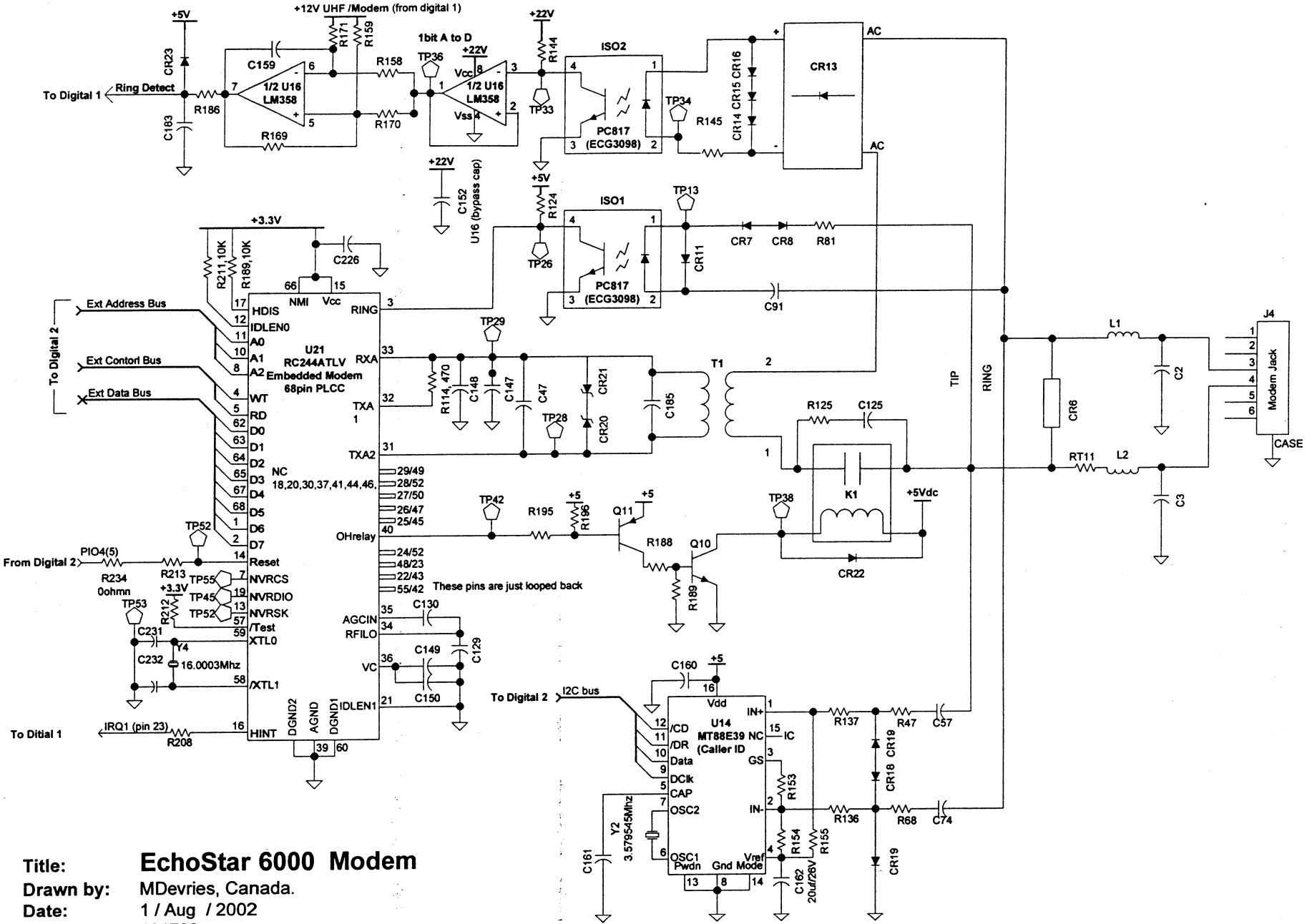
Title: **EchoStar 6000 LNB tuner**

Drawn by: MDevries, Canada.

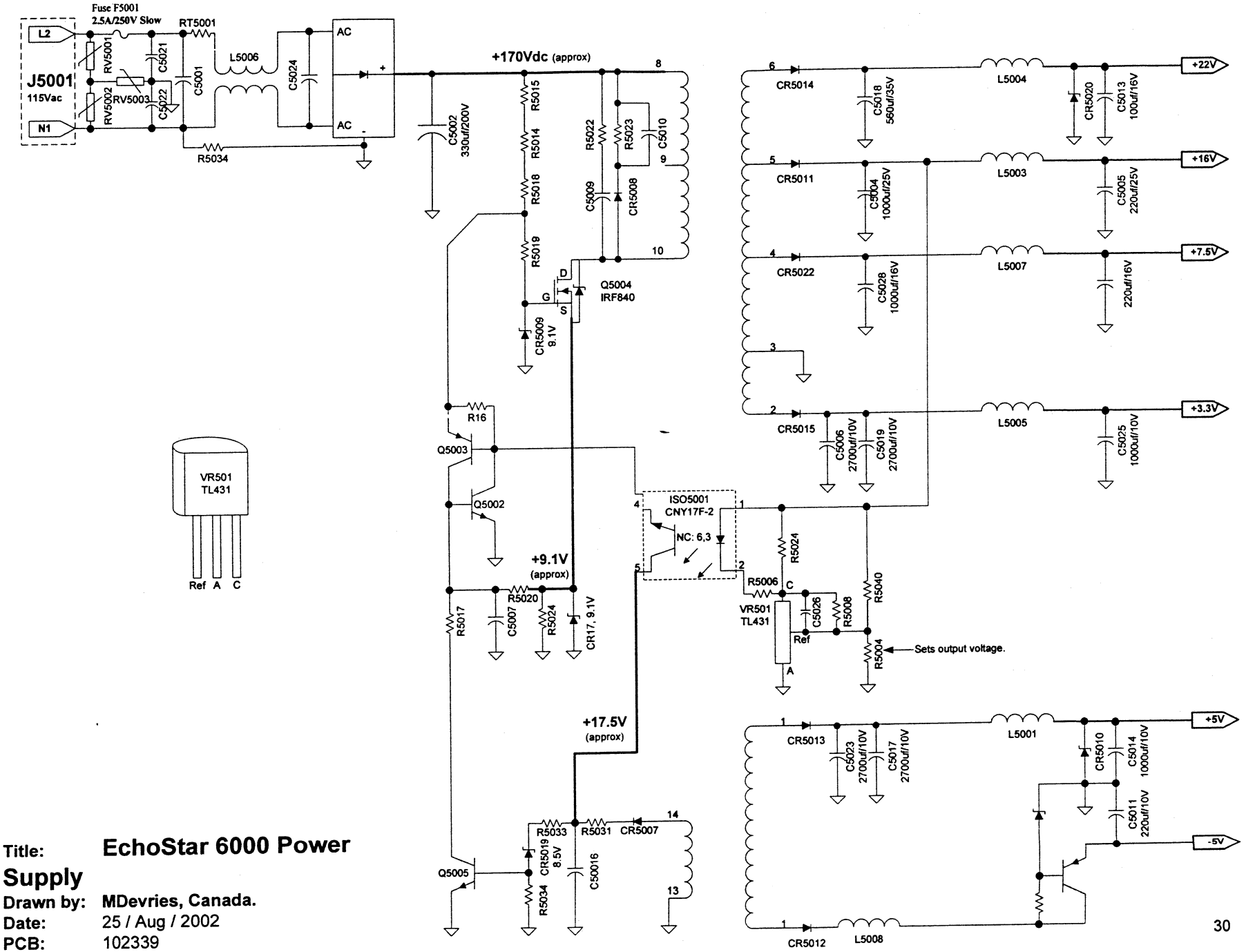
Date: 8 / Aug / 2002

PCB/SCH: 101722 / 101721

Comments: Drawn without datasheets so drawing has not been crosschecked and **WILL** have errors.

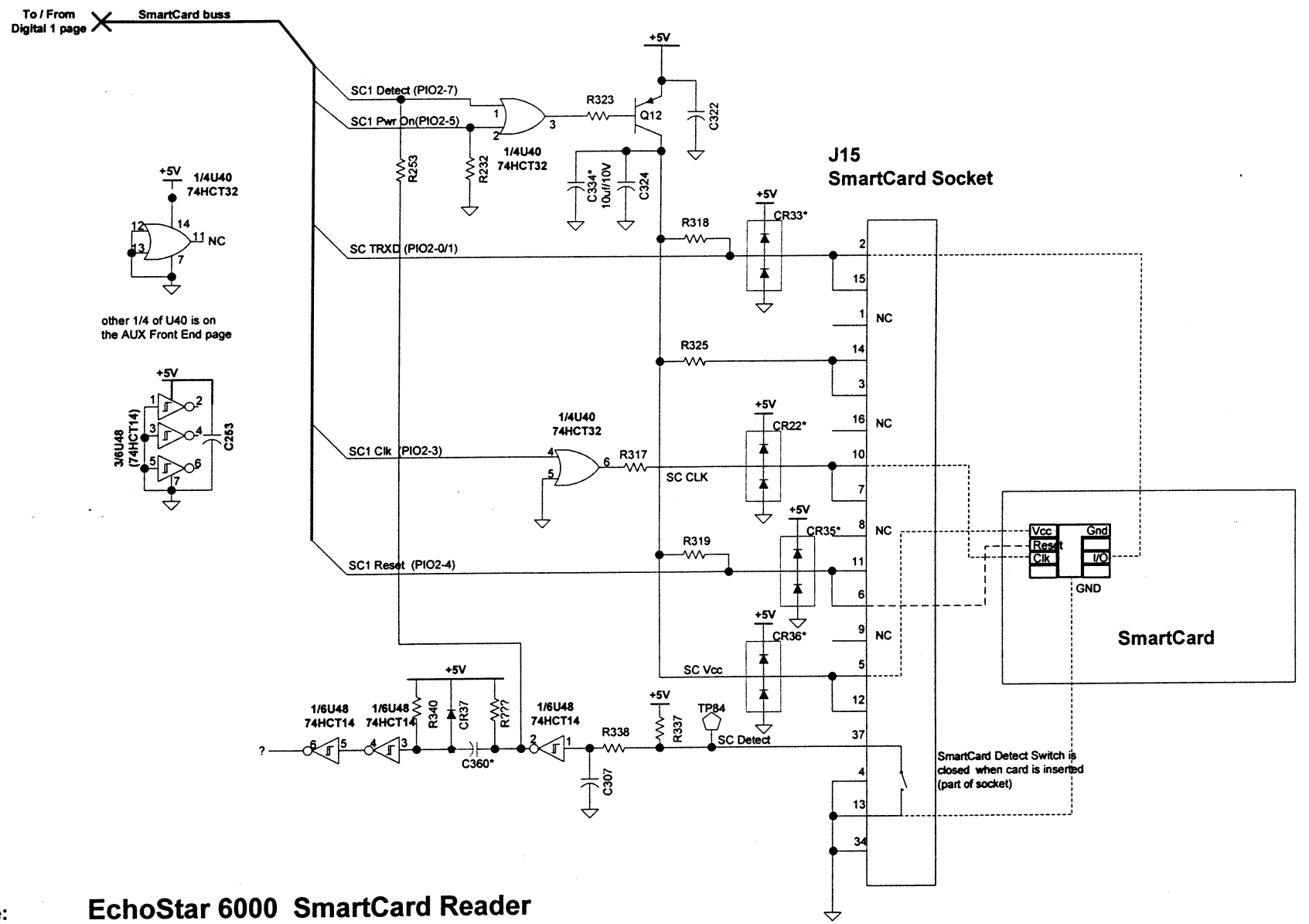


Title:	**EchoStar 6000 Modem**
Drawn by:	MDevries, Canada.
Date:	1 / Aug / 2002
PCB:	101722
SCH:	101721

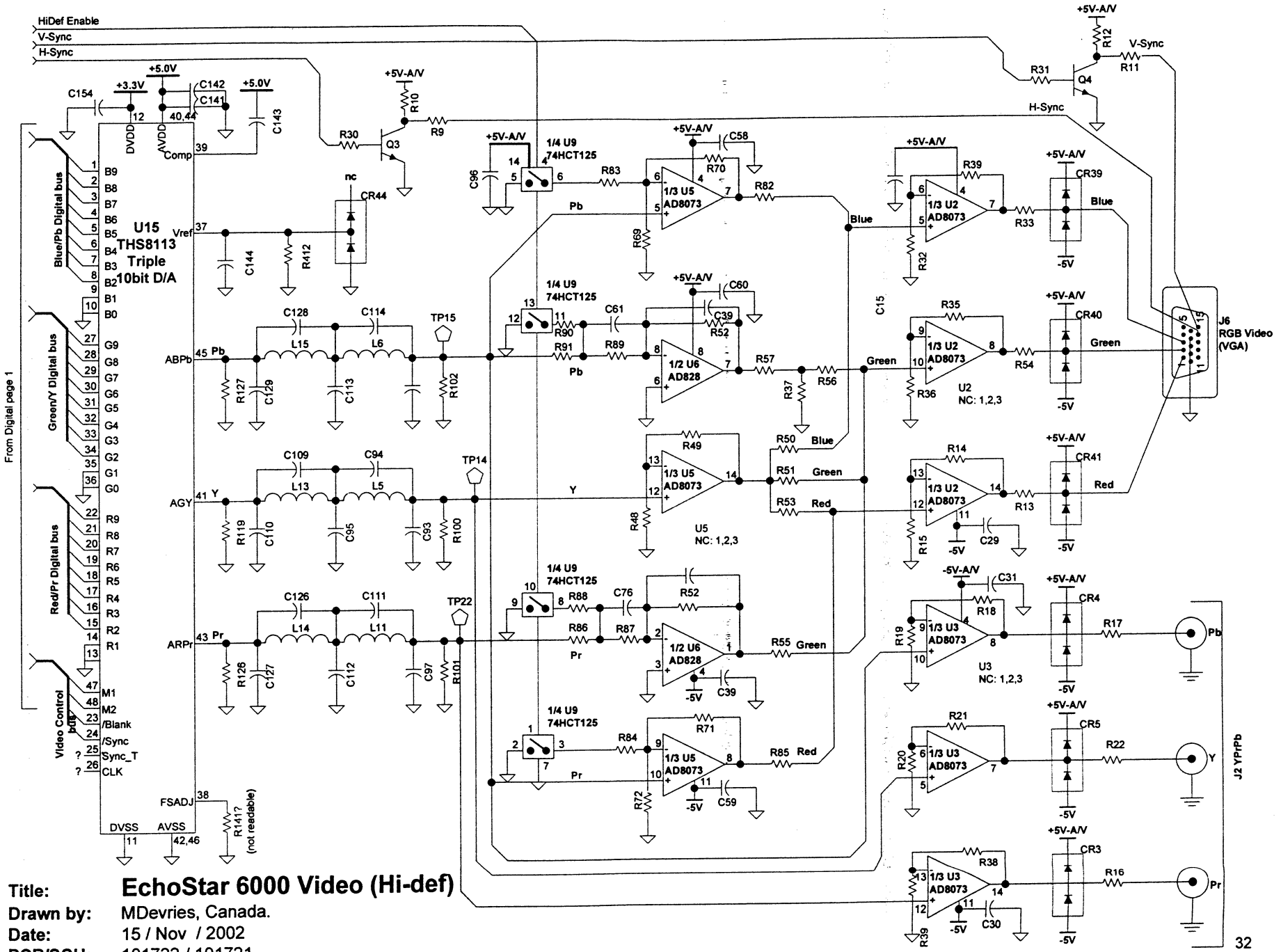


Title: **EchoStar 6000 Power Supply**

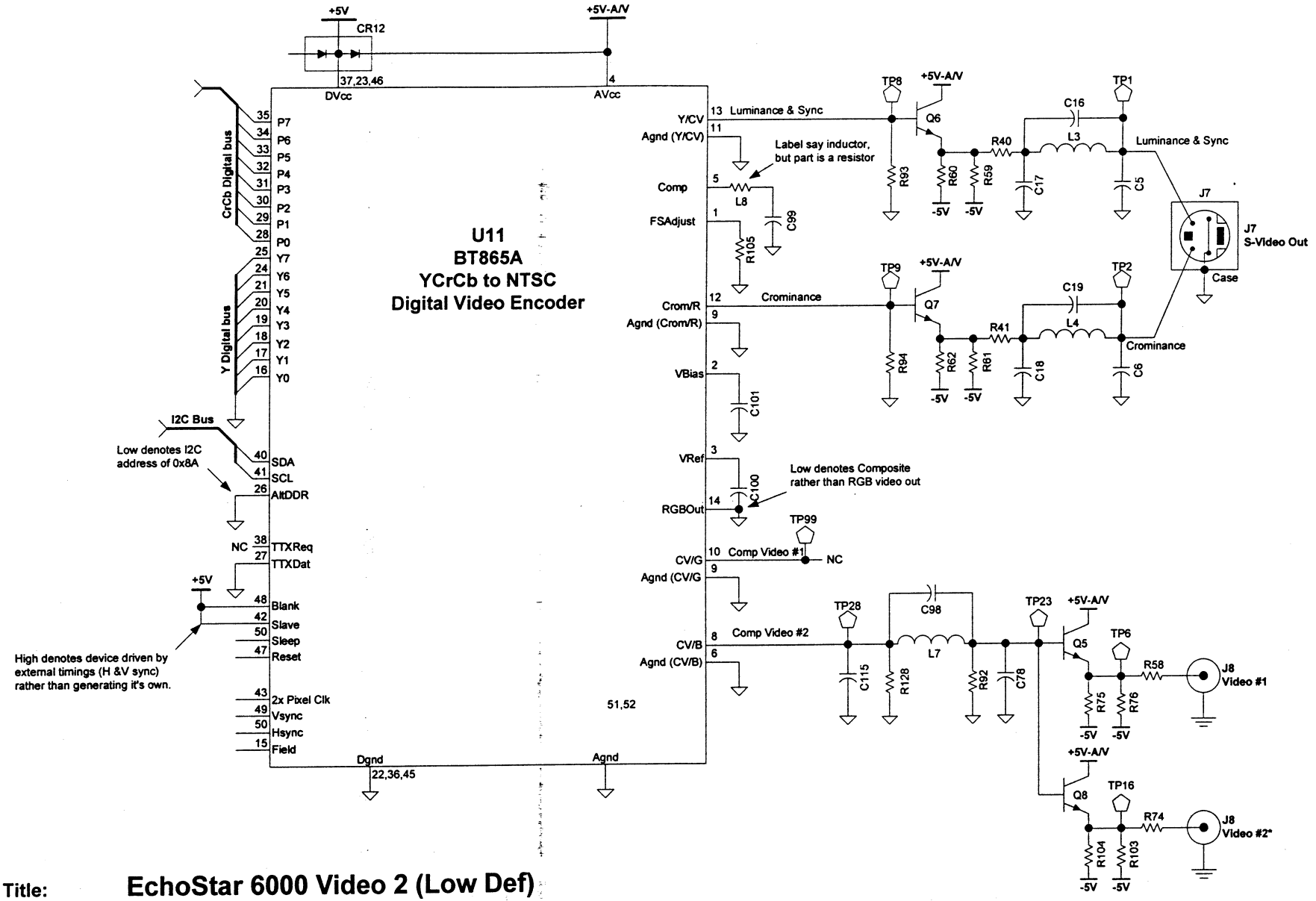
Drawn by: MDevries, Canada.
Date: 25 / Aug / 2002
PCB: 102339
SCH: 102338



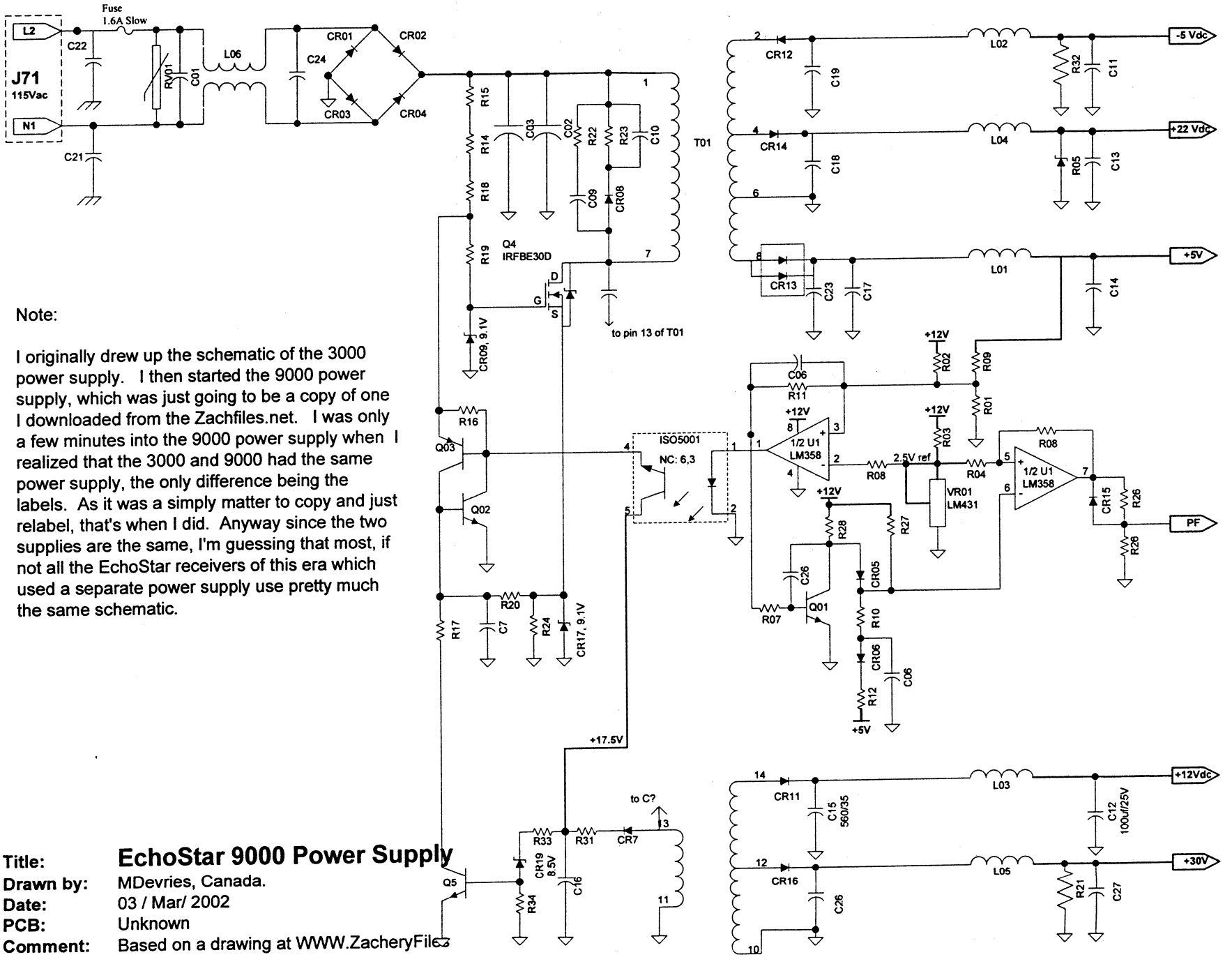
Title: **EchoStar 6000 SmartCard Reader**
Drawn by: MDevries, Canada.
Date: 05 / Sept / 2002
PCB/SCH: 101722/101721



Title: EchoStar 6000 Video (Hi-def)
Drawn by: MDevries, Canada.
Date: 15 / Nov / 2002
PCB/SCH: 101722 / 101721



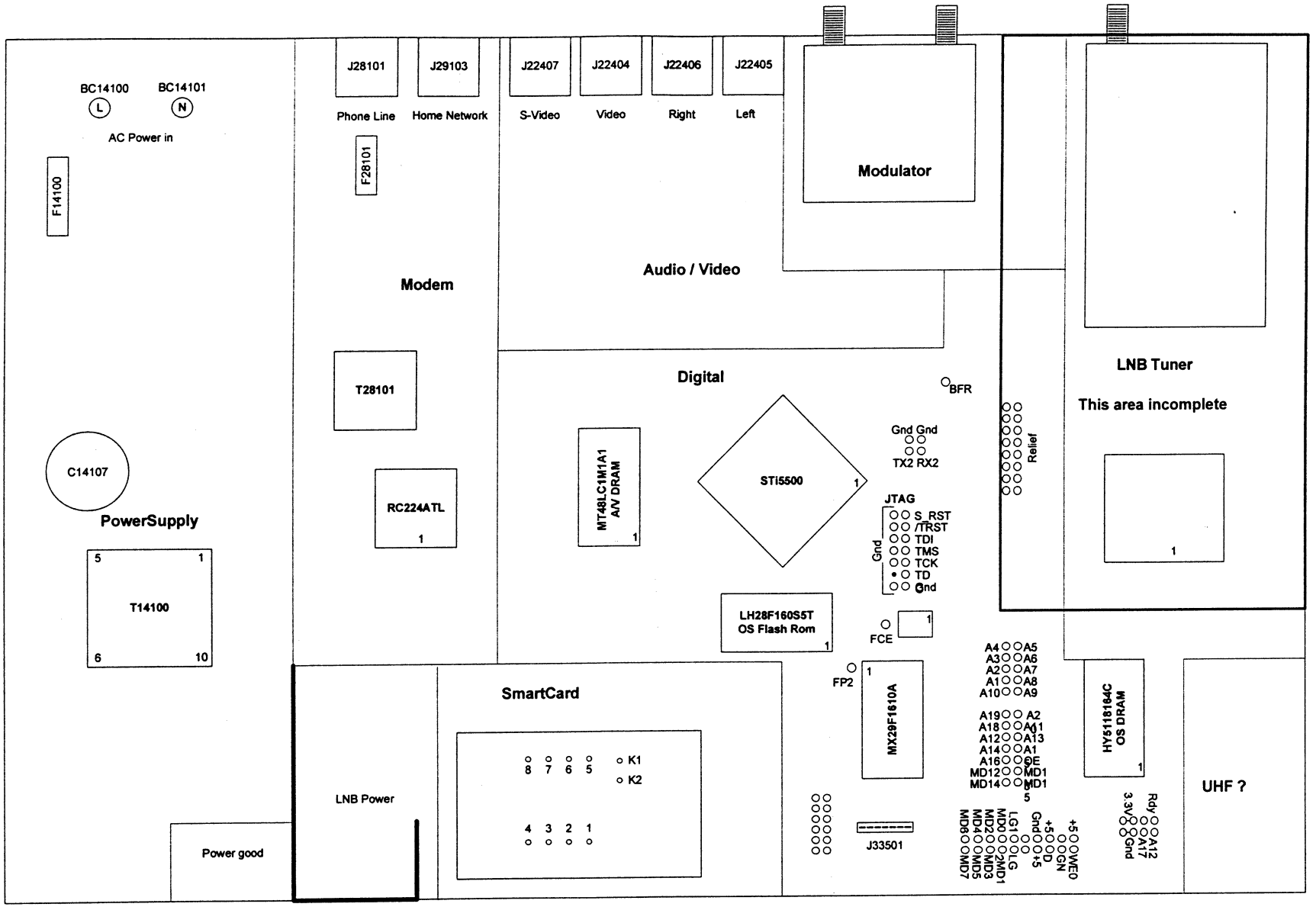
Title: **EchoStar 6000 Video 2 (Low Def)**
Drawn by: MDevries, Canada.
Date: 16 / Nov / 2002
PCB/SCH: 101722 / 101721



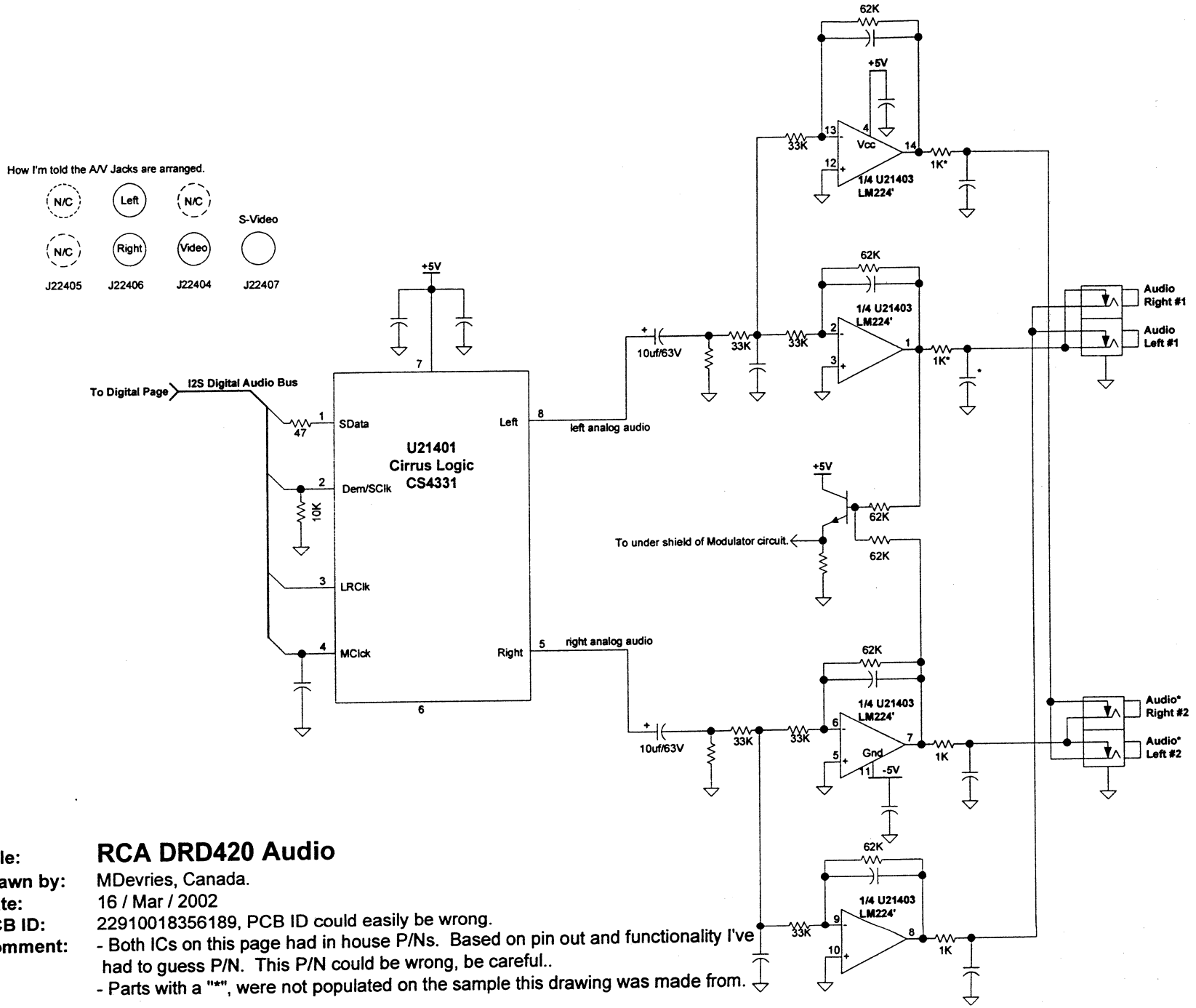
Note:

I originally drew up the schematic of the 3000 power supply. I then started the 9000 power supply, which was just going to be a copy of one I downloaded from the Zachfiles.net. I was only a few minutes into the 9000 power supply when I realized that the 3000 and 9000 had the same power supply, the only difference being the labels. As it was a simply matter to copy and just relabel, that's when I did. Anyway since the two supplies are the same, I'm guessing that most, if not all the EchoStar receivers of this era which used a separate power supply use pretty much the same schematic.

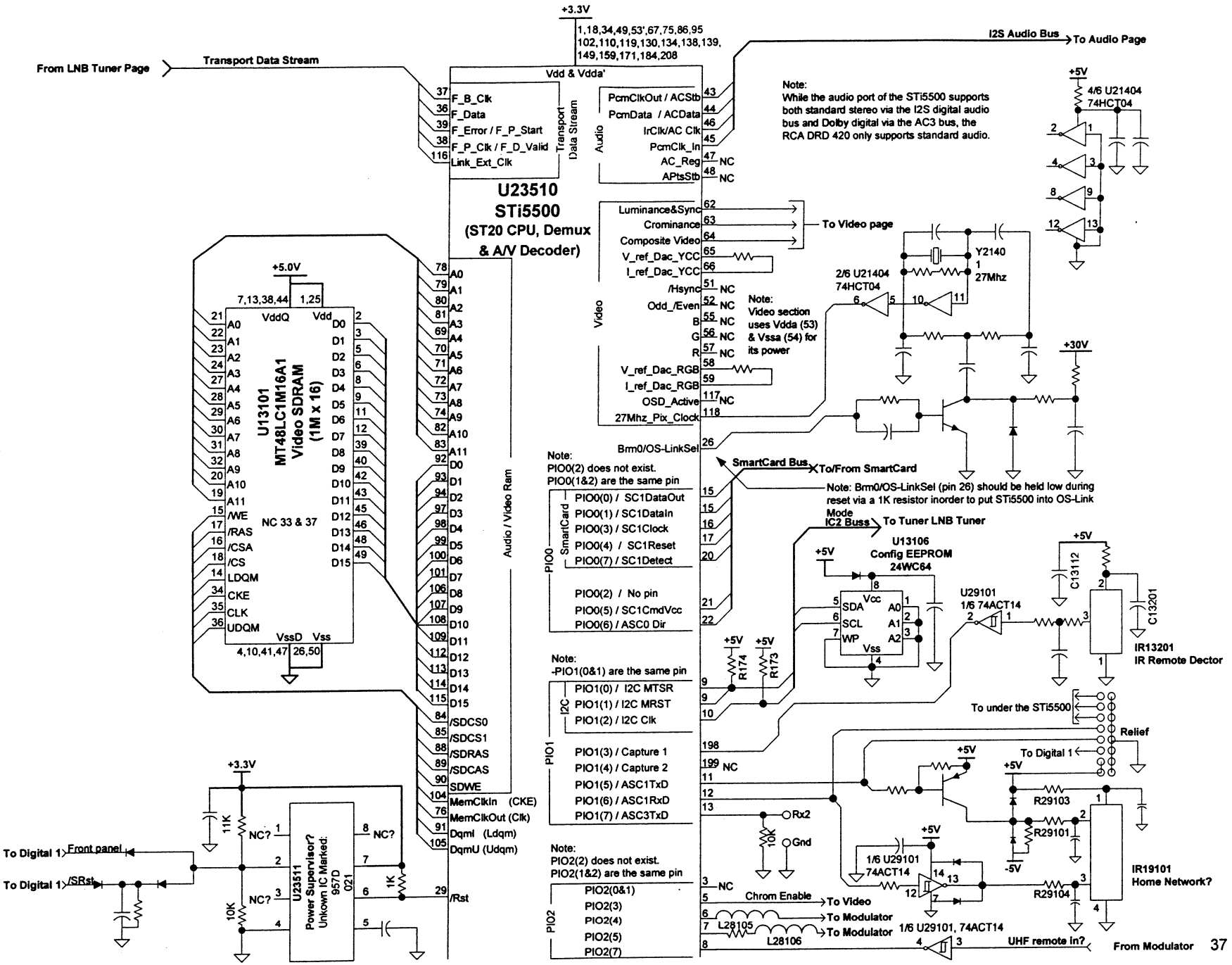
Title: **EchoStar 9000 Power Supply**
Drawn by: MDevries, Canada.
Date: 03 / Mar/ 2002
PCB: Unknown
Comment: Based on a drawing at WWW.ZacheryFile3

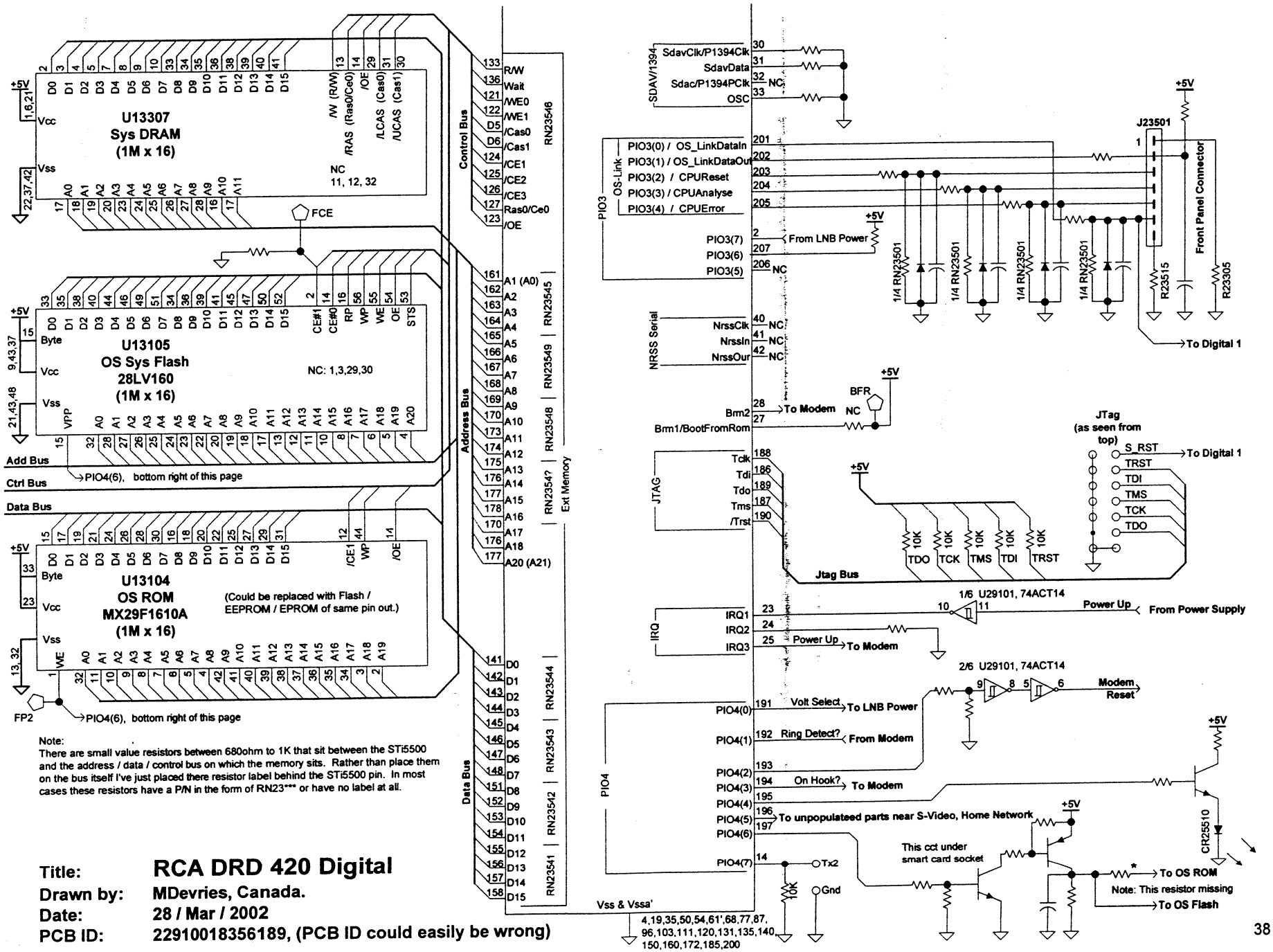


Title: **RCA DRD420 Parts Layout**
Drawn by: MDevries, Canada.
Date: 10 / Mar / 2002
PCB Ident: 22910018356189 (this could be wrong)



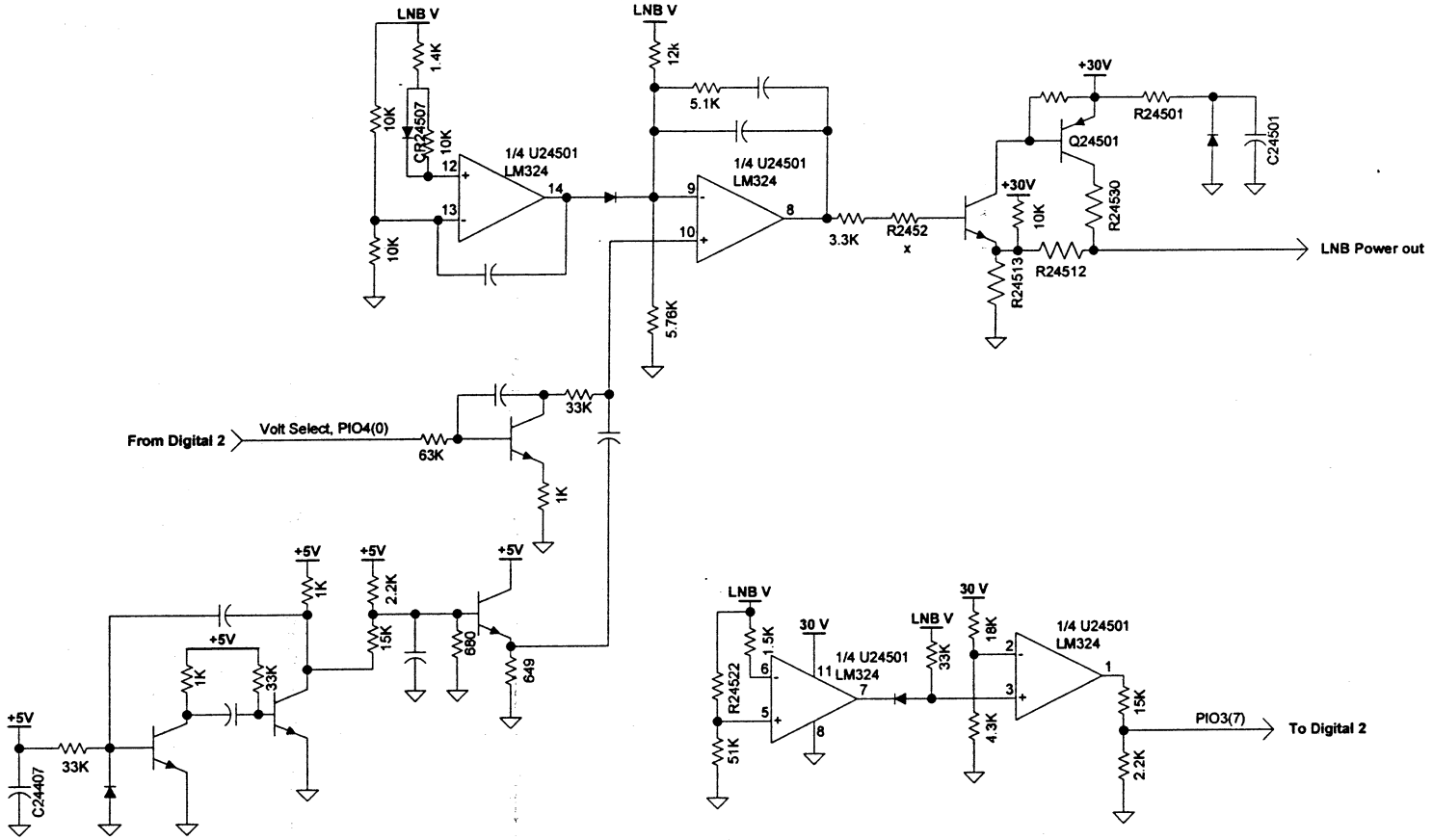
Title: **RCA DRD420 Audio**
Drawn by: MDevries, Canada.
Date: 16 / Mar / 2002
PCB ID: 22910018356189, PCB ID could easily be wrong.
Comment: - Both ICs on this page had in house P/Ns. Based on pin out and functionality I've had to guess P/N. This P/N could be wrong, be careful..
- Parts with a "*", were not populated on the sample this drawing was made from.


+3.3V
1,18,34,49,53',67,75,86,95
102,110,119,130,134,138,139,
149,159,171,184,208
Vdd & Vdda'
From LNB Tuner Page
Transport Data Stream
37 F_B_Clk
36 F_Data
39 F_Error / F_P_Start
38 F_P_Clk / F_D_Valid
116 Link_Ext_Clk
Transport Data Stream
U23510
STi5500
(ST20 CPU, Demux
& A/V Decoder)
Audio
PcmClkOut / ACStb 43
PcmData / ACData 44
IrClk/AC Clk 46
PcmClk_In 45
AC_Reg 47 NC
APtsStb 48 NC
I2S Audio Bus
To Audio Page
Note:
While the audio port of the STi5500 supports
both standard stereo via the I2S digital audio
bus and Dolby digital via the AC3 bus, the
RCA DRD 420 only supports standard audio.
+5V
4/6 U21404
74HCT04
Video
Luminance&Sync 62
Crominance 63
Composite Video 64
V_ref_Dac_YCC 65
I_ref_Dac_YCC 66
/Hsync 51 NC
Odd_/Even 52 NC
B 55 NC
G 56 NC
R 57 NC
V_ref_Dac_RGB 58
I_ref_Dac_RGB 59
OSD_Active 117 NC
27Mhz_Pix_Clock 118
To Video page
Note:
Video section
uses Vdda (53)
& Vssa (54) for
its power
Y2140
1
27Mhz
2/6 U21404
74HCT04
+30V
Brm0/OS-LinkSel 26
SmartCard Bus
To/From SmartCard
Note: Brm0/OS-LinkSel (pin 26) should be held low during
reset via a 1K resistor inorder to put STi5500 into OS-Link
Mode
IC2 Buss
To Tuner LNB Tuner
Note:
PIO0(2) does not exist.
PIO0(1&2) are the same pin
PIO0
SmartCard
PIO0(0) / SC1DataOut
PIO0(1) / SC1DataIn
PIO0(3) / SC1Clock
PIO0(4) / SC1Reset
PIO0(7) / SC1Detect
PIO0(2) / No pin
PIO0(5) / SC1CmdVcc
PIO0(6) / ASC0 Dir
U13106
Config EEPROM
24WC64
SDA
SCL
WP
Vcc
Vss
A0
A1
A2
U29101
1/6 74ACT14
C13112
C13201
IR13201
IR Remote Dector
+5V
R174
R173
Note:
-PIO1(0&1) are the same pin
PIO1
I2C
PIO1(0) / I2C MTSR
PIO1(1) / I2C MRST
PIO1(2) / I2C Clk
PIO1(3) / Capture 1
PIO1(4) / Capture 2
PIO1(5) / ASC1TxD
PIO1(6) / ASC1RxD
PIO1(7) / ASC3TxD
To under the STi5500
Relief
To Digital 1
R29103
R29101
R29104
-5V
IR19101
Home Network?
Rx2
Gnd
10K
1/6 U29101
74ACT14
Note:
PIO2(2) does not exist.
PIO2(1&2) are the same pin
PIO2
PIO2(0&1)
PIO2(3)
PIO2(4)
PIO2(5)
PIO2(7)
Chrom Enable
To Video
To Modulator
To Modulator
L28105
L28106
1/6 U29101, 74ACT14
UHF remote In?
From Modulator
Audio / Video Ram
A0 78
A1 79
A2 80
A3 81
A4 69
A5 70
A6 71
A7 72
A8 73
A9 74
A10 82
A11 83
D0 92
D1 93
D2 94
D3 97
D4 98
D5 99
D6 100
D7 101
D8 106
D9 107
D10 108
D11 109
D12 112
D13 113
D14 114
D15 115
/SDCS0 84
/SDCS1 85
/SDRAS 88
/SDCAS 89
SDWE 90
MemClkIn (CKE) 104
MemClkOut (Clk) 76
Dqml (Ldqm) 91
DqmU (Udqm) 105
+5.0V
7,13,38,44 VddQ
1,25 Vdd
U13101
MT48LC1M16A1
Video SDRAM
(1M x 16)
NC 33 & 37
VssD 4,10,41,47
Vss 26,50
/WE
/RAS
/CSA
/CS
LDQM
CKE
CLK
UDQM
+3.3V
11K
NC?
10K
1K
U23511
Power Supervisor?
Unkown IC Marked:
957D
021
To Digital 1 Front panel
To Digital 1 /SRst
/Rst 29

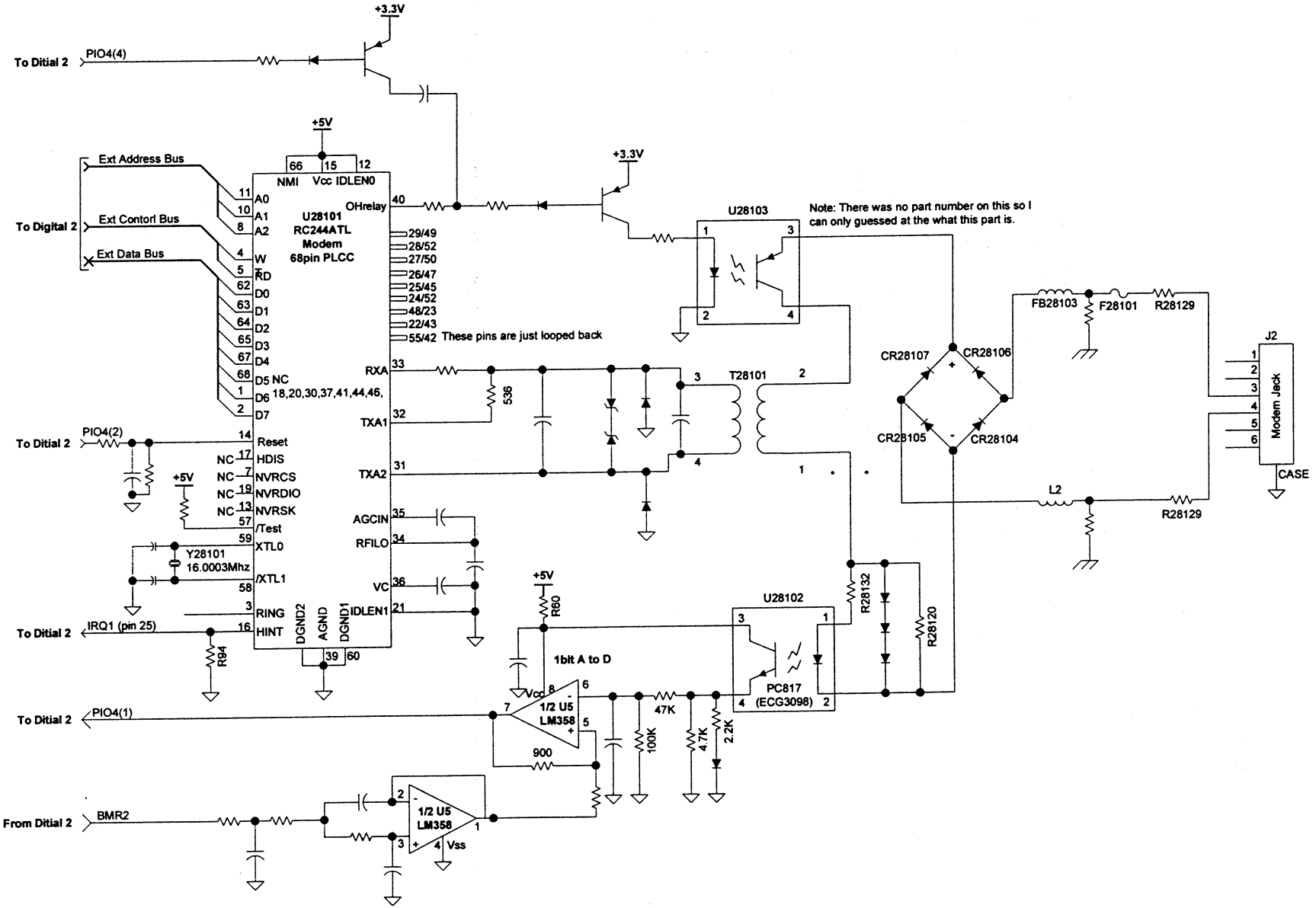


Note:
There are small value resistors between 680ohm to 1K that sit between the STi5500 and the address / data / control bus on which the memory sits. Rather than place them on the bus itself I've just placed there resistor label behind the STi5500 pin. In most cases these resistors have a P/N in the form of RN23*** or have no label at all.

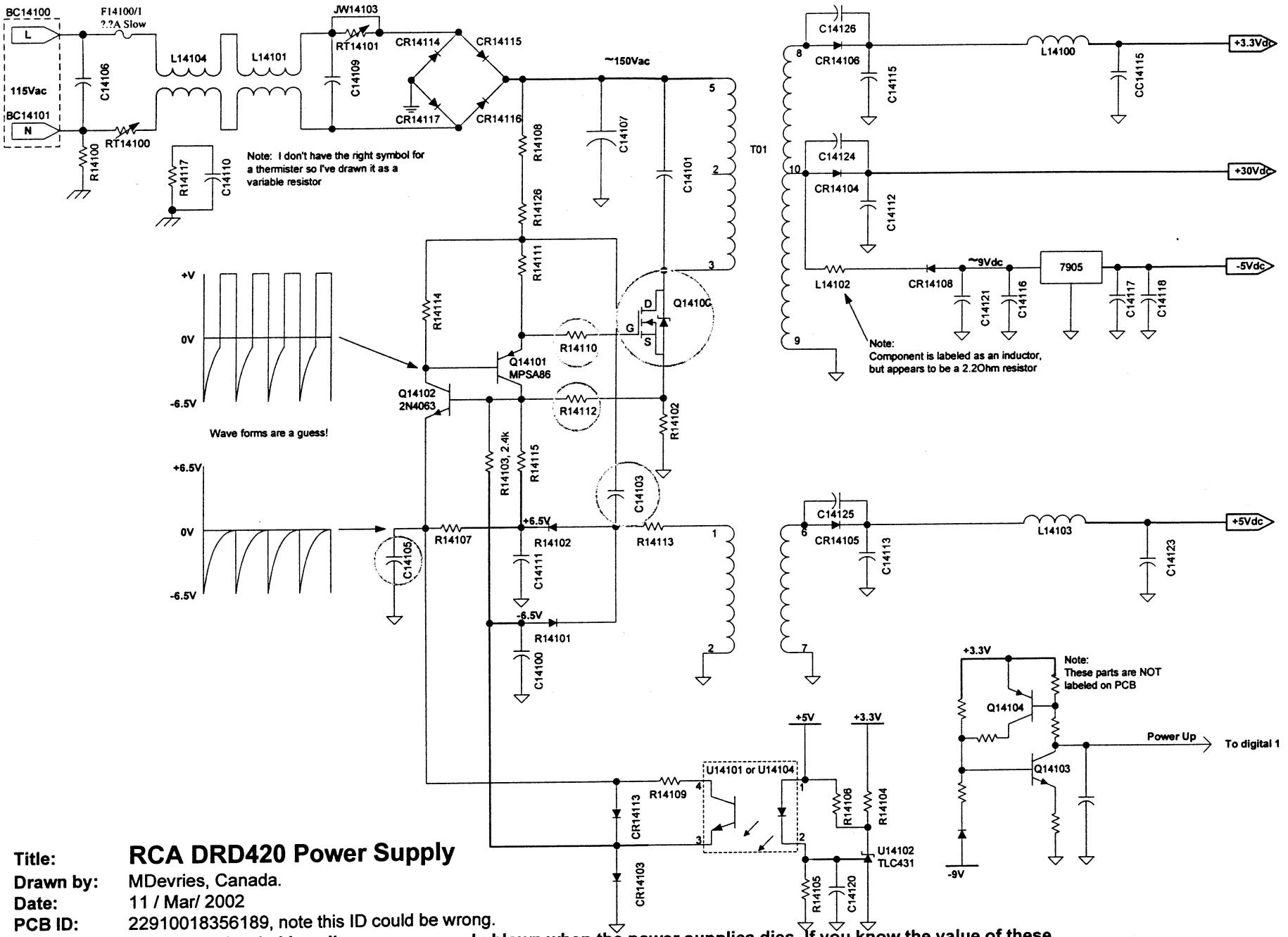
Title: **RCA DRD 420 Digital**
Drawn by: **MDevries, Canada.**
Date: **28 / Mar / 2002**
PCB ID: **22910018356189, (PCB ID could easily be wrong)**



Title: **RCA DRD420 LNB Power**
Drawn by: MDevries, Canada.
Date: 28 / Mar / 2002
PCB ID: 229100183561897, PCB ID could easily be wrong



Title: **RCA DRD420 Modem**
Drawn by: MDevries, Canada.
Date: 25 / Mar / 2002
PCB ID: 22910018356189?, PCB ID could easily be wrong



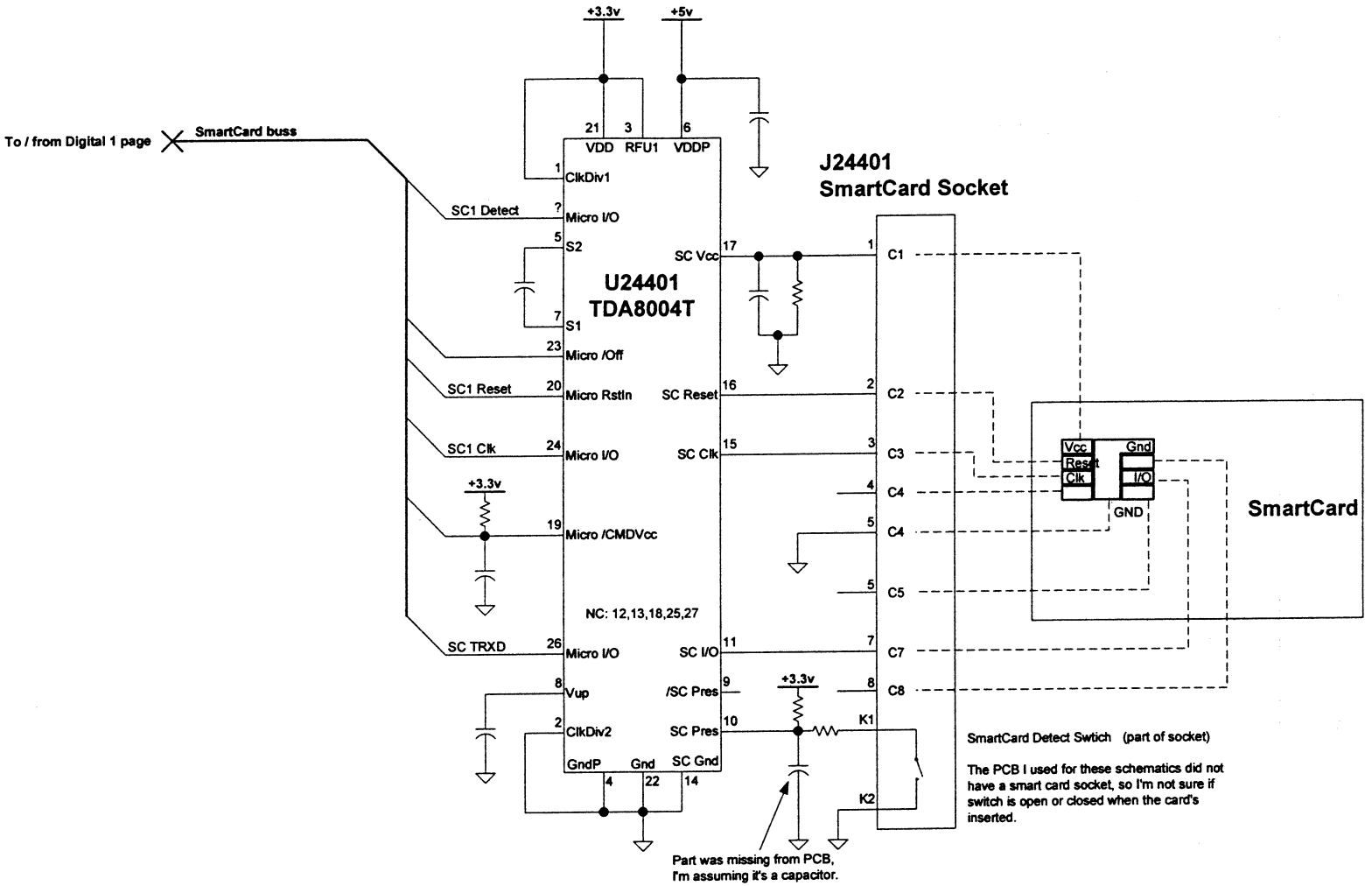
Title: **RCA DRD420 Power Supply**

Drawn by: MDevries, Canada.

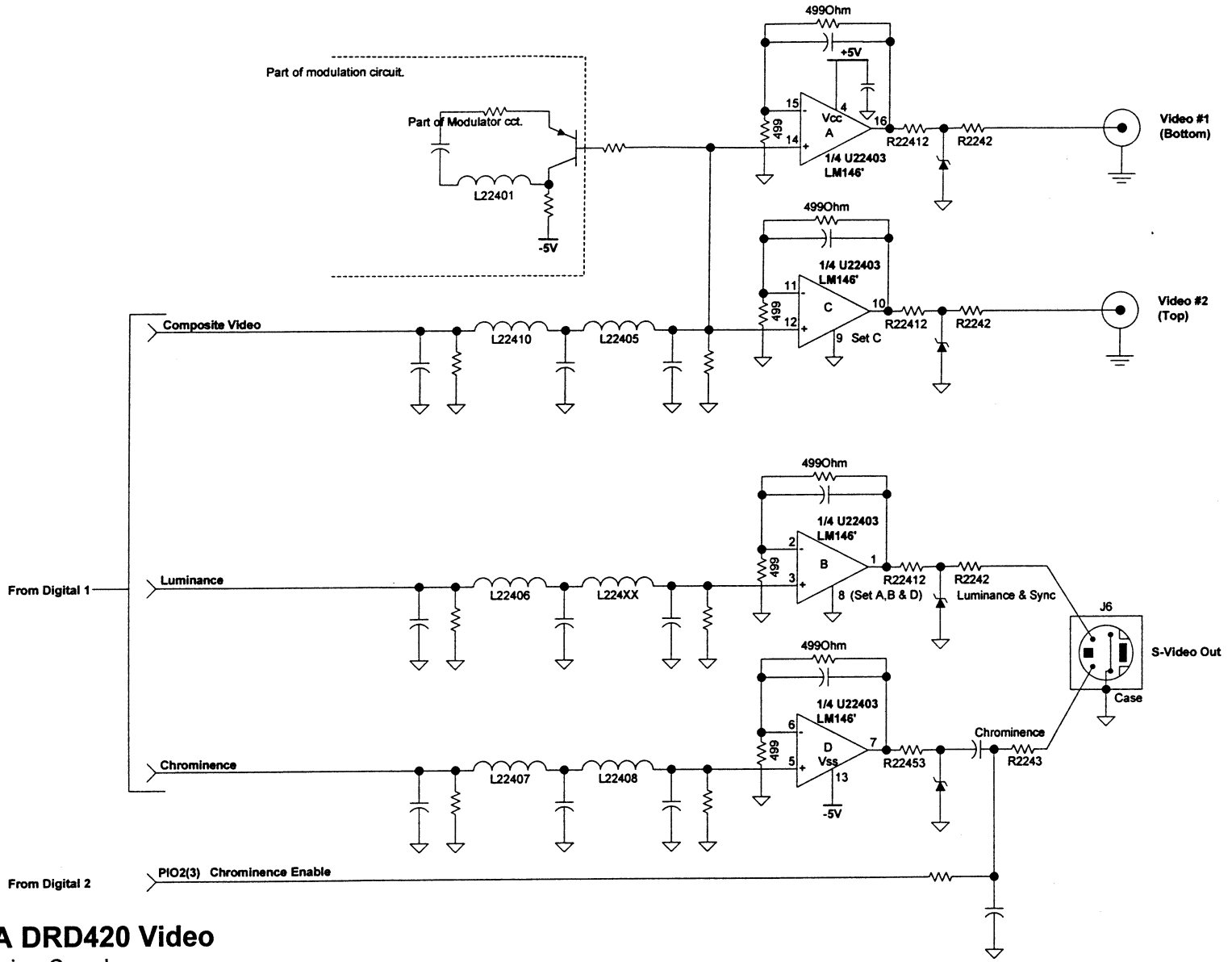
Date: 11 / Mar/ 2002

PCB ID: 22910018356189, note this ID could be wrong.

Comment: **The parts circuled in yellow are commonly blown when the power supplies dies. If you know the value of these parts please let me know so I can include this in the schematic.**



Title: **RCA DRD420 SmartCard**
Drawn by: MDevries, Canada.
Date: 18 / Mar/ 2002
PCB ID: 22910018356189 (this could be wrong)



Title: **RCA DRD420 Video**
Drawn by: MDevries, Canada.
Date: 18 / Mar / 2002
PCB ID: 22910018356189, PCB ID could easily be wrong
Comment: With only in house marking on the Video Op Amp I can only guess at the p/n. Therefore while the LM146 fits both pin out and functionality, I cannot promise that this the correct p/n, there are other 16 pin quad op amps that might be better suited.